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Irving et al.

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(45) **Date of Patent: Apr. 22, 2025**

(54) **SYSTEMS AND METHODS TO MONITOR PATIENT DEVICES**

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(73) Assignee: **Murj, Inc.**, Santa Cruz, CA (US)

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G16H 15/00 (2018.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G16H 40/67*** (2018.01); ***G16H 15/00*** (2018.01); ***G16H 20/00*** (2018.01); ***H04W 4/80*** (2018.02)

(58) **Field of Classification Search**
CPC G16H 40/67; G16H 15/00; G16H 20/00; G16H 20/10; G16H 20/40; G16H 50/30; H04W 4/80
(Continued)

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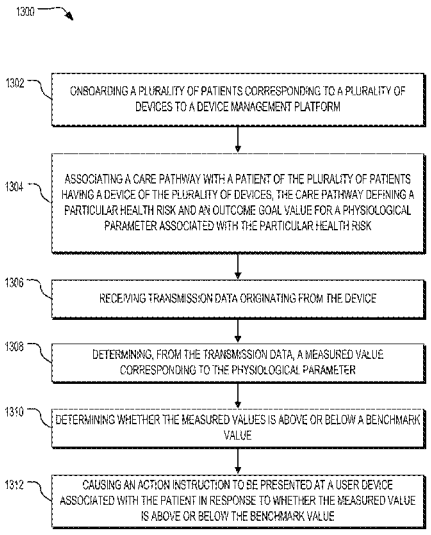
Primary Examiner — Joy Chng
(74) *Attorney, Agent, or Firm* — Polsinelli PC

(57) **ABSTRACT**

Systems and methods include a device management platform for managing a plurality of devices (e.g., for a clinic system). A system can include a patient system such as a patient device (e.g., an implanted cardiac device, a mobile device, etc.) which transmits data to the device management platform and/or a clinic system. The device management platform tracks measured physiological parameters of the patient. Transmission data received from the patient system includes data corresponding to the measured physiological parameters. The device management platform generates a workflow interface at the clinic system based on a care pathway, a billing pathway, and the measured physiological parameters. Additionally, the device management platform can determine an outcome goal value and one or more benchmark values to reach the outcome goal value, and can send action instructions (e.g., to the patient system) based on comparing the measured physiological parameters to the one or more benchmark values.

20 Claims, 12 Drawing Sheets



(51) **Int. Cl.**
G16H 20/00 (2018.01)
H04W 4/80 (2018.01)

(58) **Field of Classification Search**
USPC 705/2–3
See application file for complete search history.

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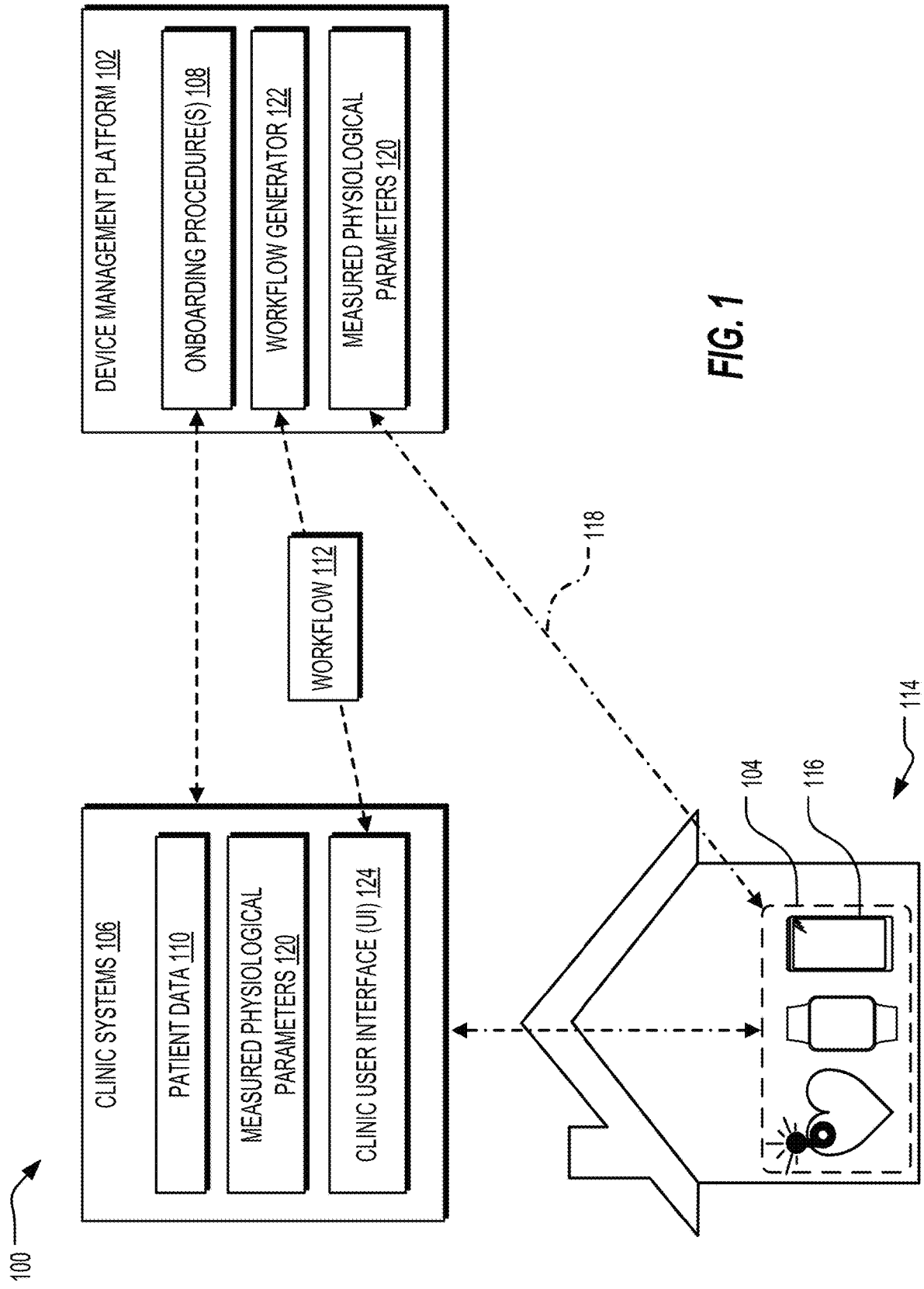
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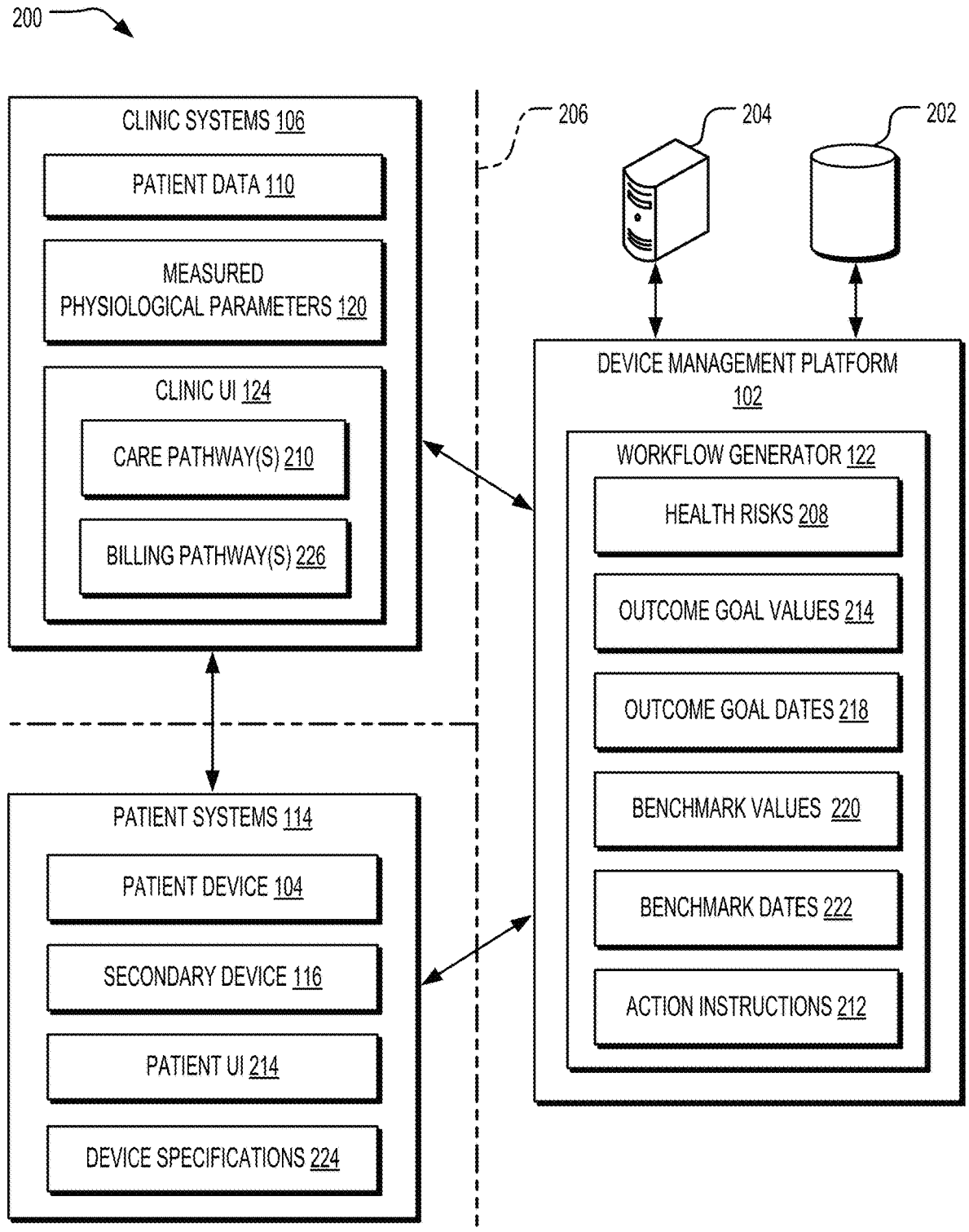
ONBOARDING PROCEDURE(S) 108
WORKFLOW GENERATOR 122
MEASURED PHYSIOLOGICAL PARAMETERS 120
WORKFLOW 112
118
CLINIC SYSTEMS 106
PATIENT DATA 110
MEASURED PHYSIOLOGICAL PARAMETERS 120
CLINIC USER INTERFACE (UI) 124
104
116
114

FIG. 1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CLINIC UI 124
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BILLING PATHWAY(S) 226
206
204
202
DEVICE MANAGEMENT PLATFORM 102
WORKFLOW GENERATOR 122
HEALTH RISKS 208
OUTCOME GOAL VALUES 214
OUTCOME GOAL DATES 218
BENCHMARK VALUES 220
BENCHMARK DATES 222
ACTION INSTRUCTIONS 212
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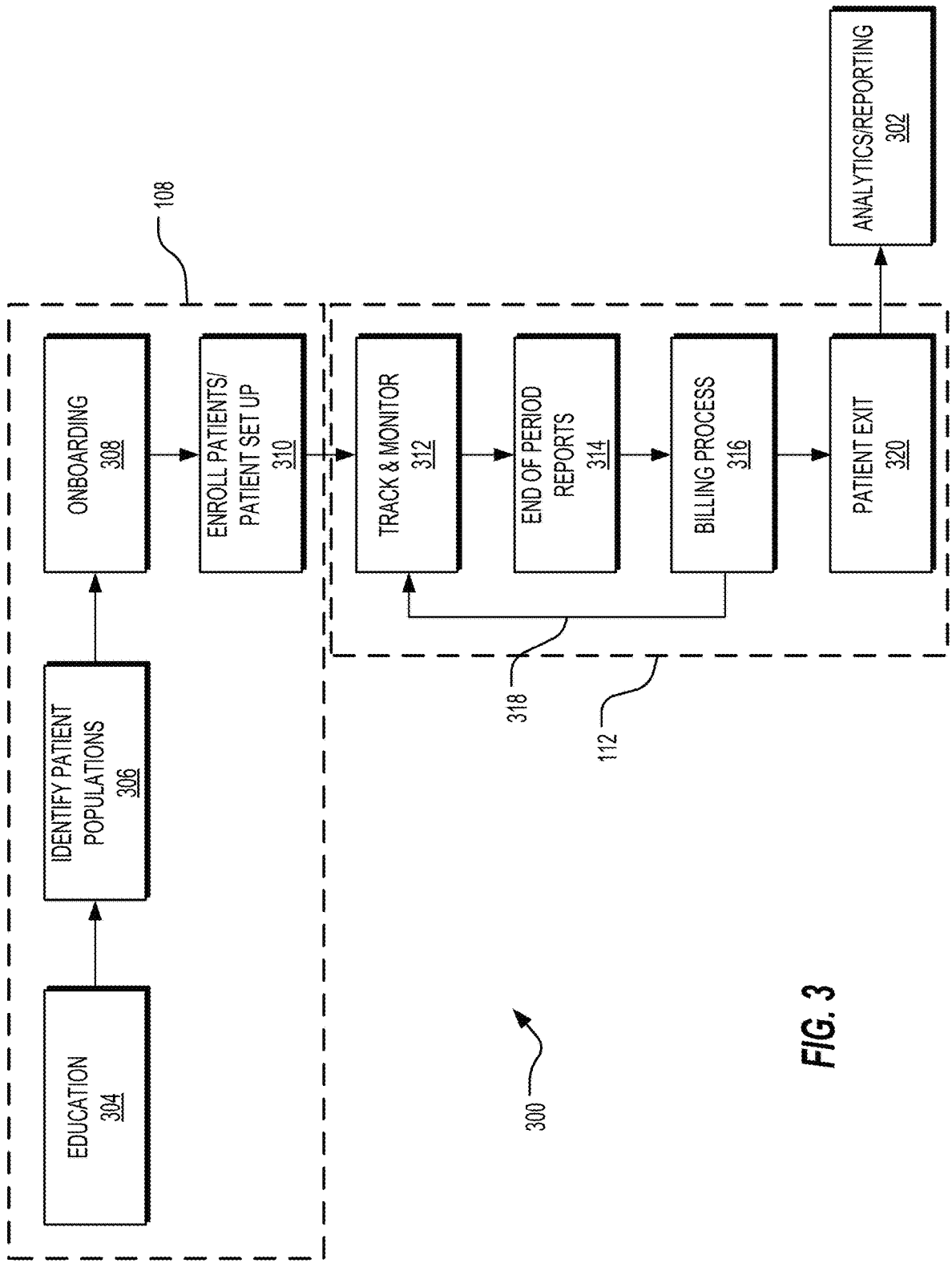
PATIENT DEVICE 104
SECONDARY DEVICE 116
PATIENT UI 214
DEVICE SPECIFICATIONS 224

FIG. 2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IDENTIFY PATIENT POPULATIONS 306
ONBOARDING 308
ENROLL PATIENTS/ PATIENT SET UP 310
TRACK & MONITOR 312
END OF PERIOD REPORTS 314
BILLING PROCESS 316
PATIENT EXIT 320
ANALYTICS/REPORTING 302
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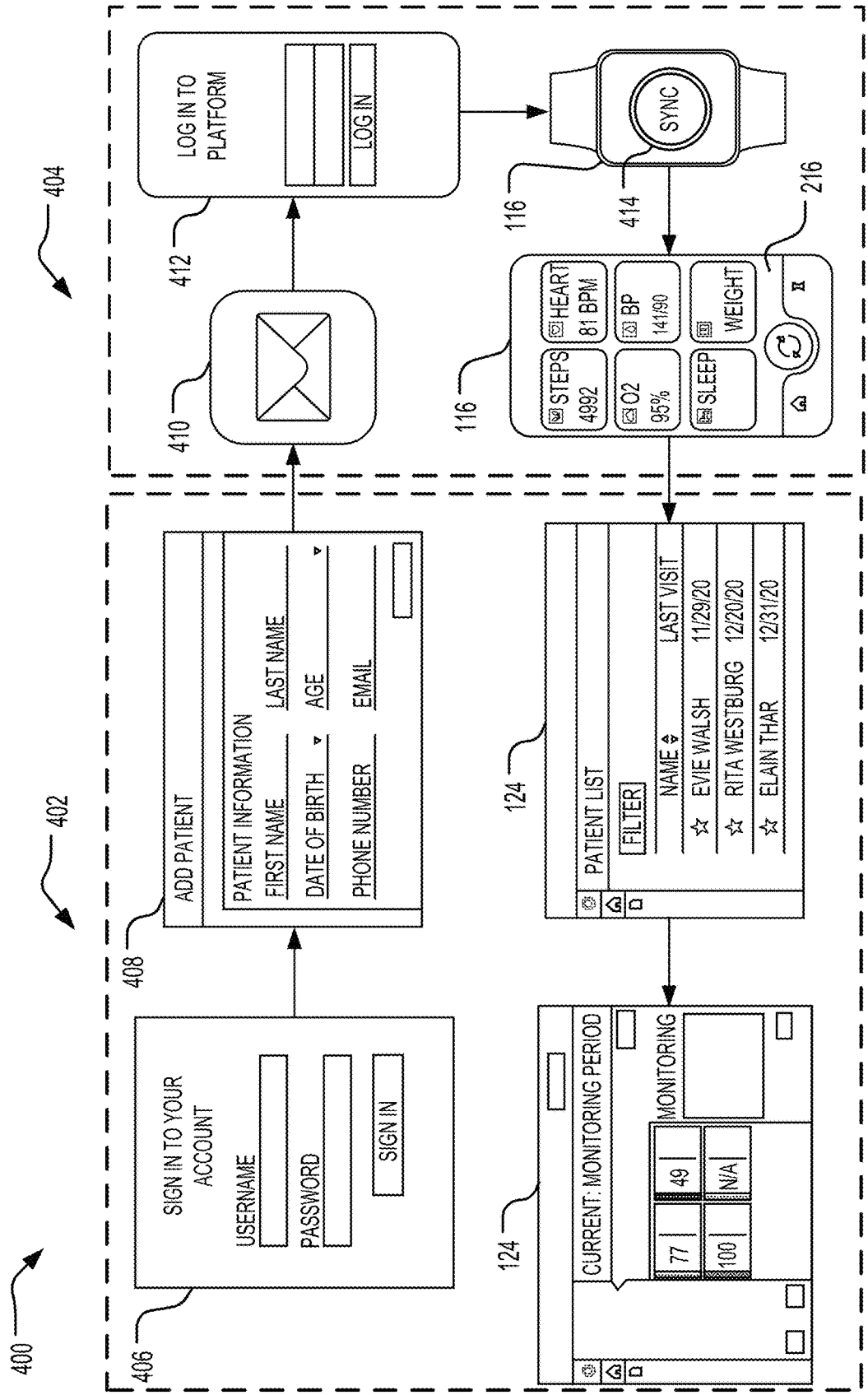
318
112
300

FIG. 3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402
404
406
408
410
412
414
116
124
216
SIGN IN TO YOUR ACCOUNT
USERNAME
PASSWORD
SIGN IN
ADD PATIENT
PATIENT INFORMATION
FIRST NAME
LAST NAME
DATE OF BIRTH
AGE
PHONE NUMBER
EMAIL
LOG IN TO PLATFORM
LOG IN
SYNC
PATIENT LIST
FILTER
NAME
LAST VISIT
EVIE WALSH 11/29/20
RITA WESTBURG 12/20/20
ELAIN THAR 12/31/20
CURRENT: MONITORING PERIOD
MONITORING
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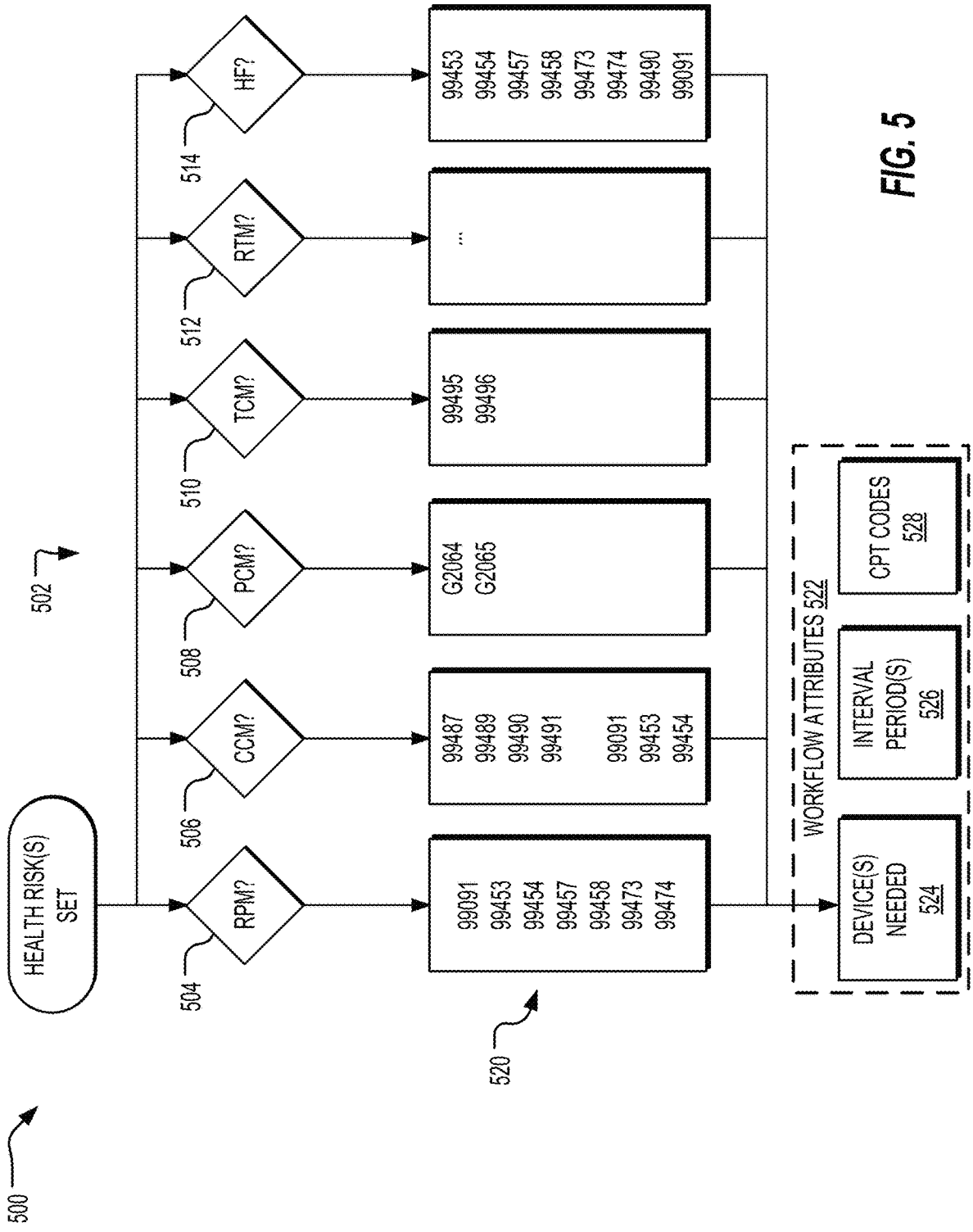
100
49
N/A
STEPS 4992
HEART 81 BPM
O2 95%
BP 141/90
SLEEP
WEIGHT

FIG. 4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502
RPM?
504
CCM?
506
PCM?
508
TCM?
510
RTM?
512
HF?
514
99091 99453 99454 99457 99458 99473 99474
99487 99489 99490 99491 99091 99453 99454
G2064 G2065
99495 99496
...
99453 99454 99457 99458 99473 99474 99490 99091
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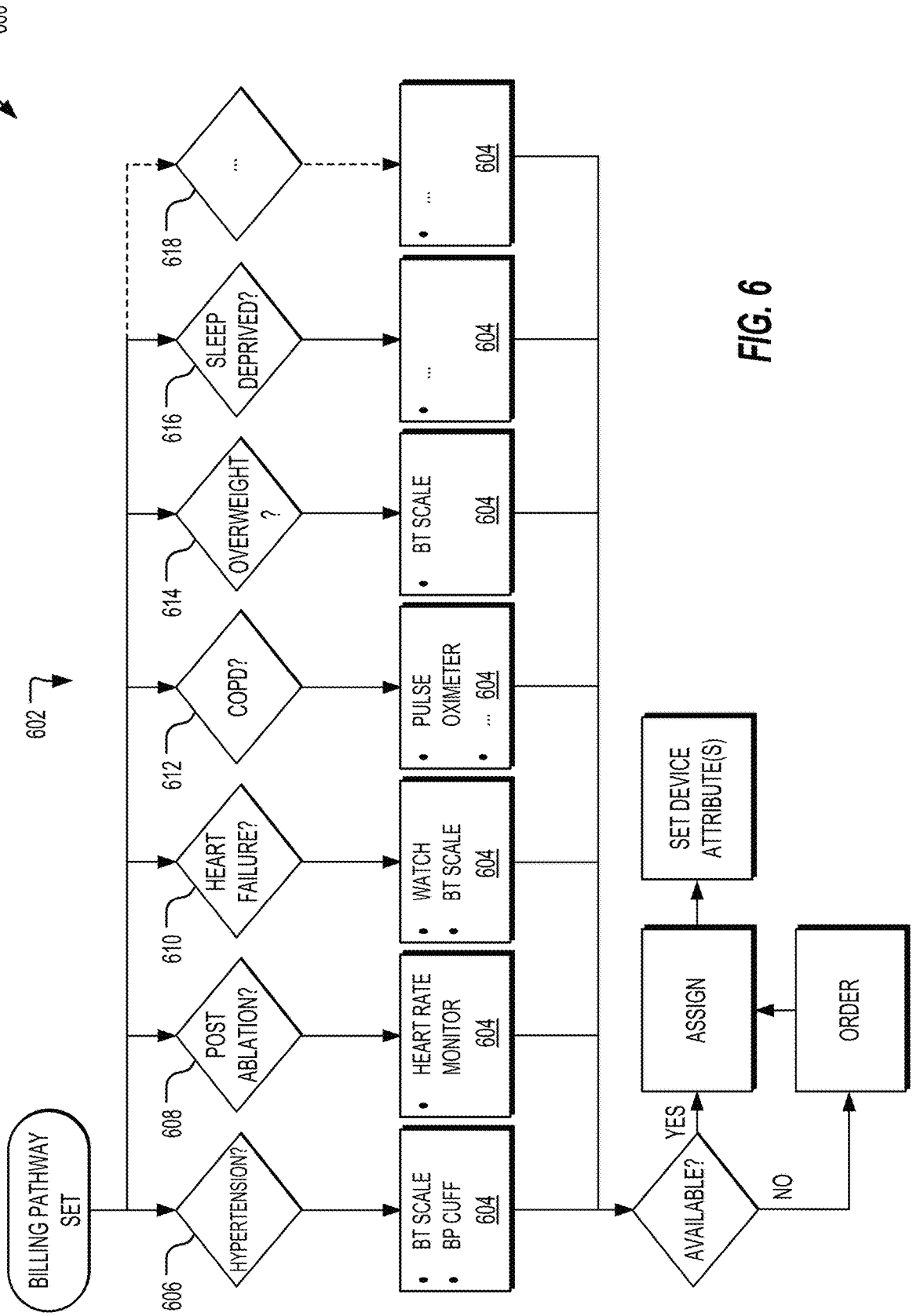
WORKFLOW ATTRIBUTES 522
DEVICE(S) NEEDED 524
INTERVAL PERIOD(S) 526
CPT CODES 528

FIG. 5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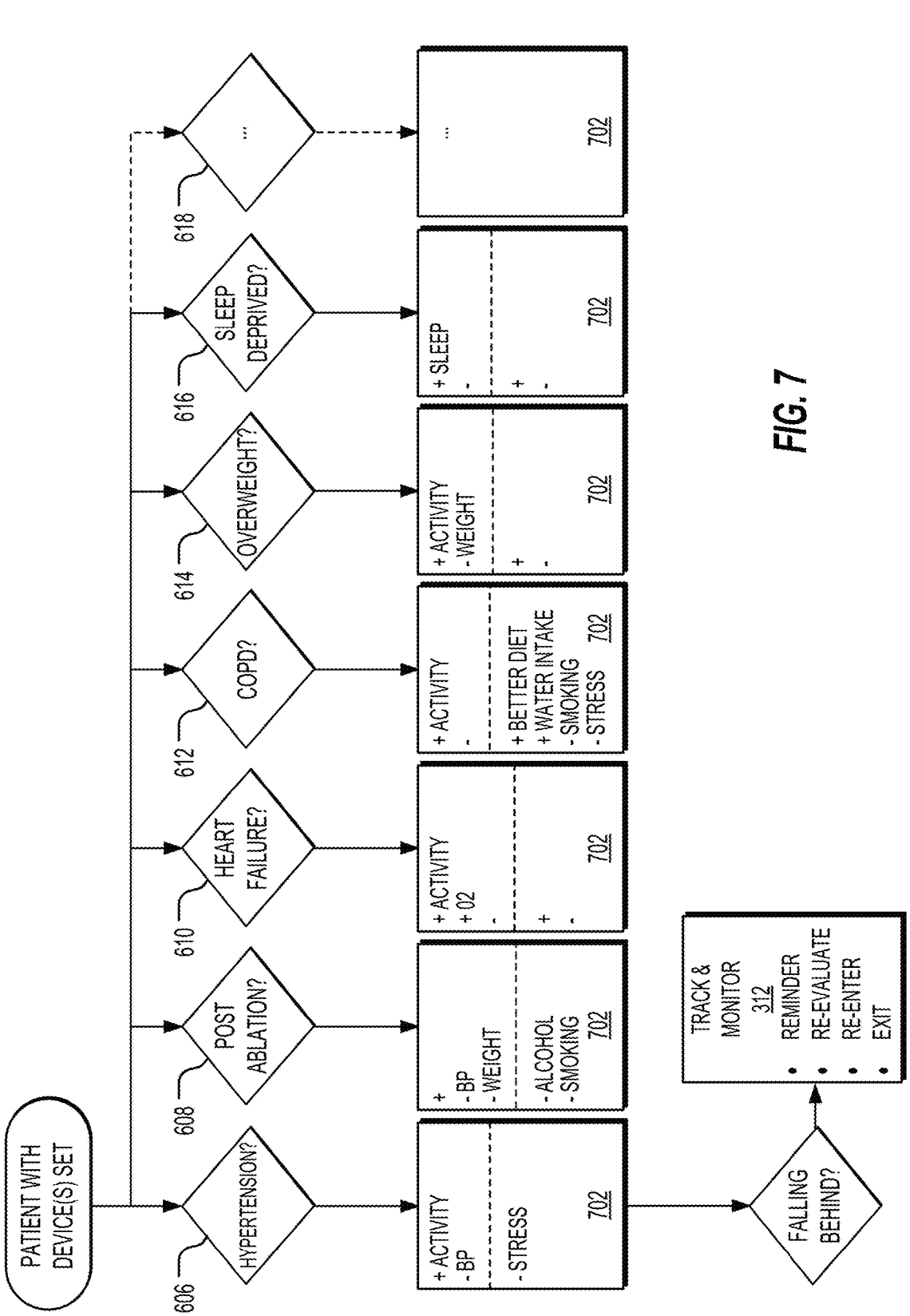
602
BILLING PATHWAY SET
606
HYPERTENSION?
608
POST ABLATION?
610
HEART FAILURE?
612
COPD?
614
OVERWEIGHT ?
616
SLEEP DEPRIVED?
618
...
BT SCALE
BP CUFF
604
HEART RATE MONITOR
604
WATCH
BT SCALE
604
PULSE OXIMETER
... 604
BT SCALE
604
...
604
...
604
AVAILABLE?
YES
NO
ASSIGN
ORDER
SET DEVICE ATTRIBUTE(S)

FIG. 6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606
HYPERTENSION?
608
POST ABLATION?
610
HEART FAILURE?
612
COPD?
614
OVERWEIGHT?
616
SLEEP DEPRIVED?
618
...
+ ACTIVITY
- BP
- STRESS
702
+
- BP
- WEIGHT
- ALCOHOL
- SMOKING
702
+ ACTIVITY
+ O2
-
+
-
702
+ ACTIVITY
-
+ BETTER DIET
+ WATER INTAKE
- SMOKING
- STRESS
702
+ ACTIVITY
- WEIGHT
+
-
702
+ SLEEP
-
+
-
702
...
702
FALLING BEHIND?
TRACK & MONITOR
312
• REMINDER
• RE-EVALUATE
• RE-ENTER
• EXIT

FIG. 7

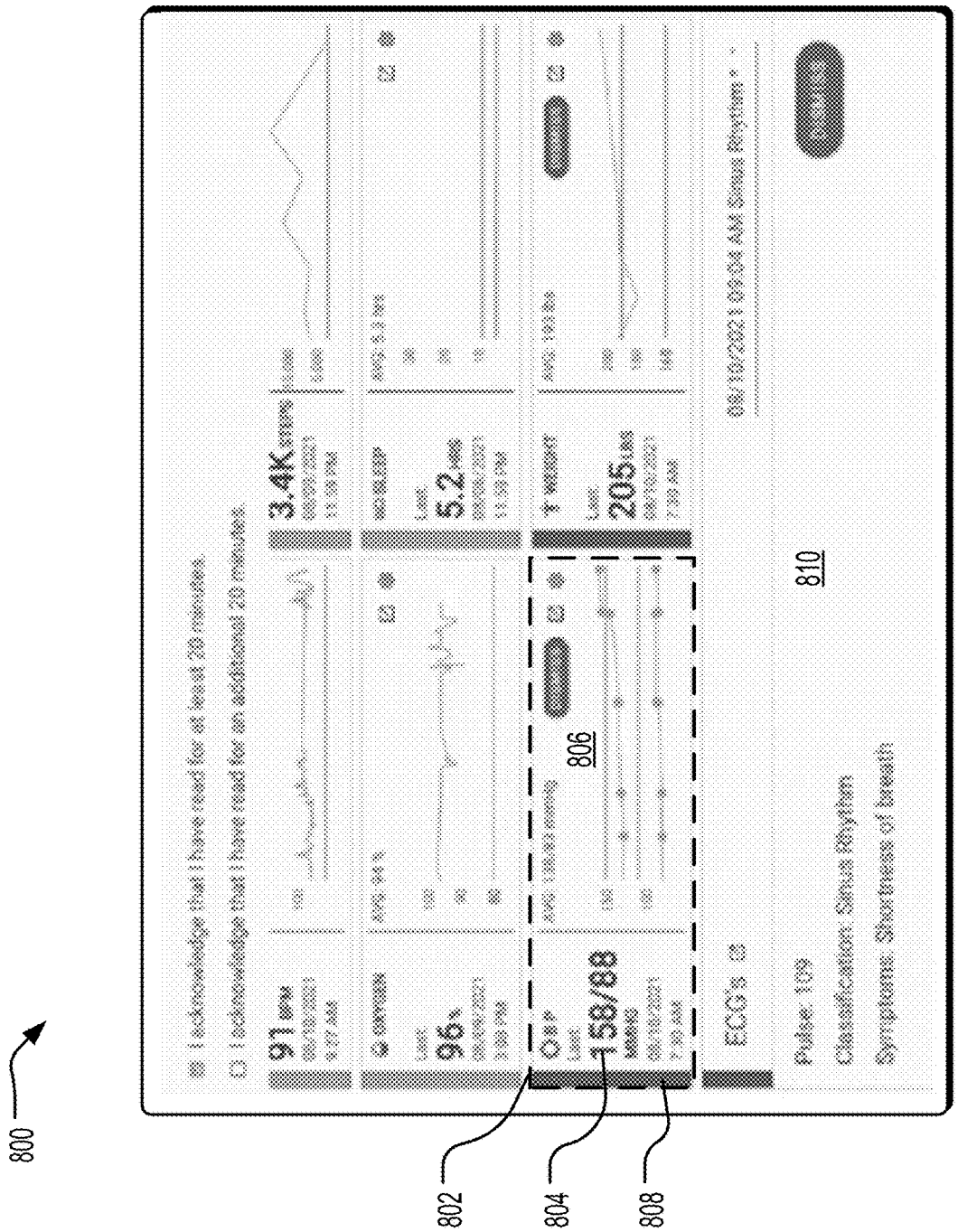
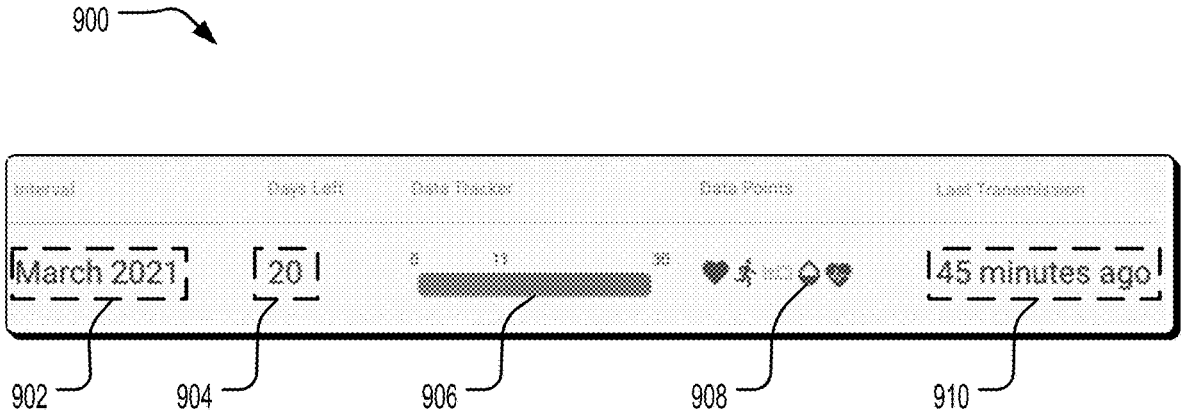

800
802
804
808
806
810
91
96
158/88
3.4K
5.2
205
Pulse 109
Classification: Sinus Rhythm
Symptoms: Shortness of breath
ECG's

FIG. 8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March 2021
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45 minutes ago
902
904
906
908
910

FIG. 9

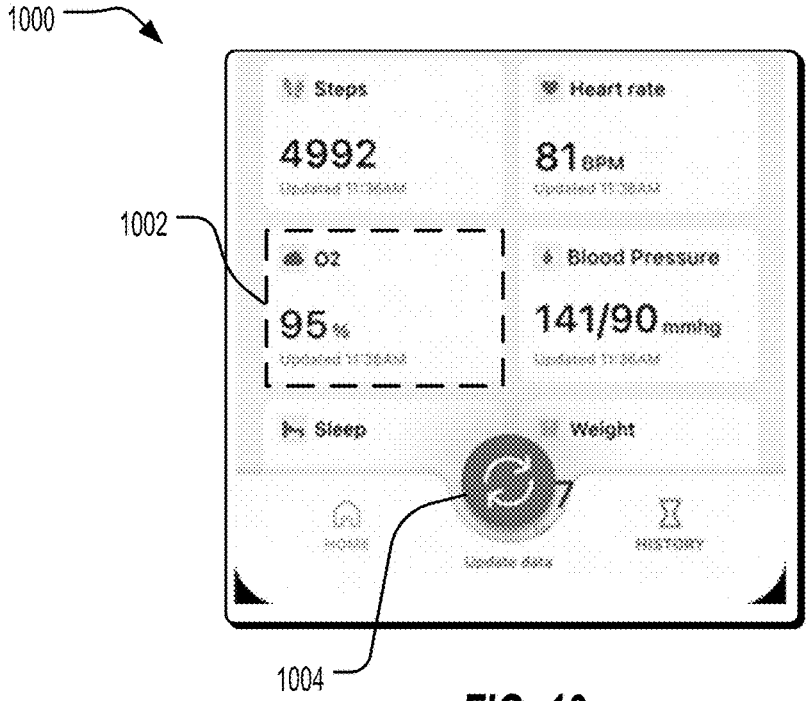
1000
Steps
4992
Heart rate
81 BPM
1002
O2
95 %
Blood Pressure
141/90 mmHg
Sleep
Weight
1004

FIG. 10

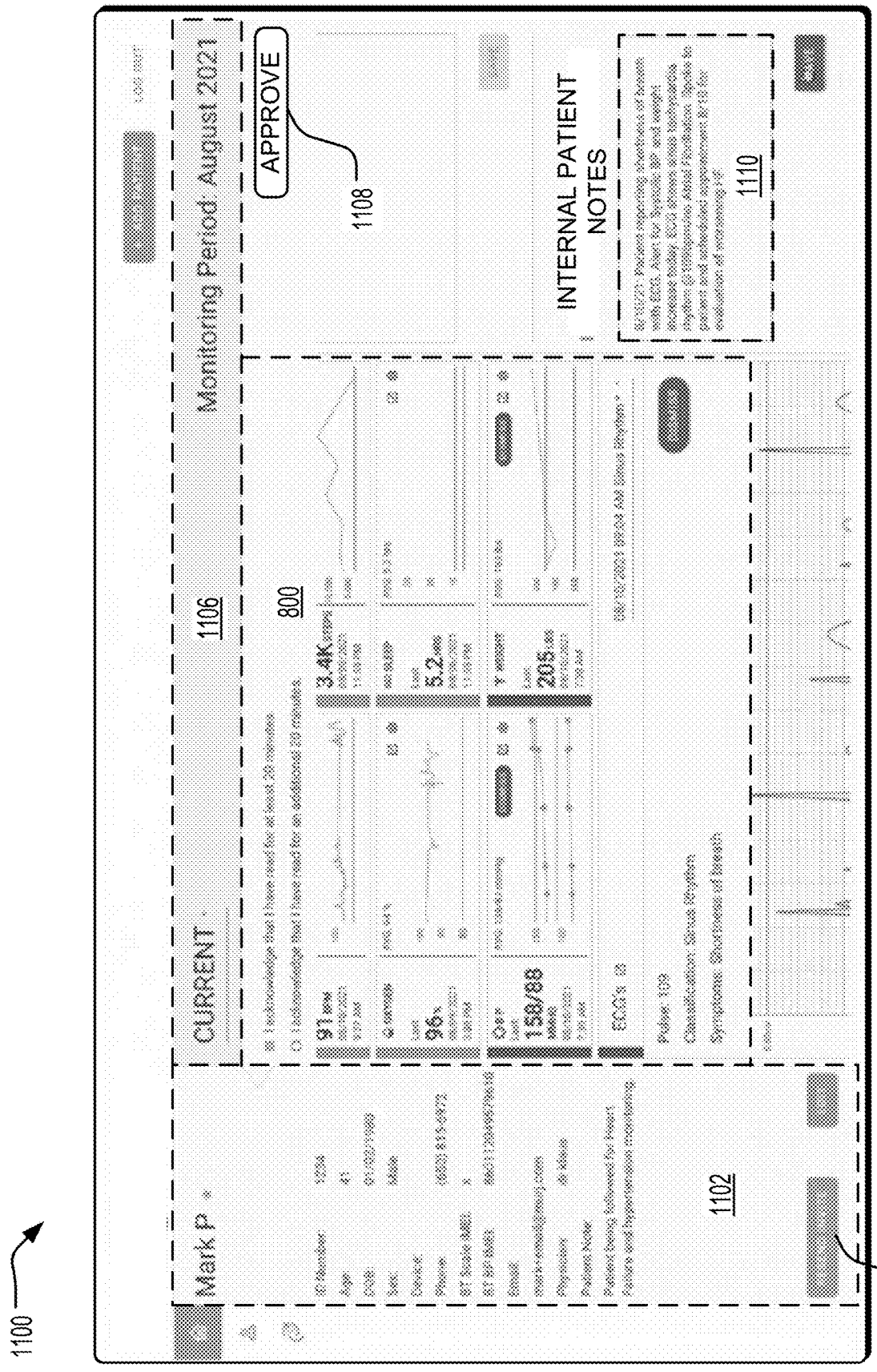
1100
1102
1104
1106
800
1108
1110
CURRENT
Monitoring Period: August 2021
APPROVE
INTERNAL PATIENT NOTES
91
96
3.4K
5.2
150/88
205

FIG. 11

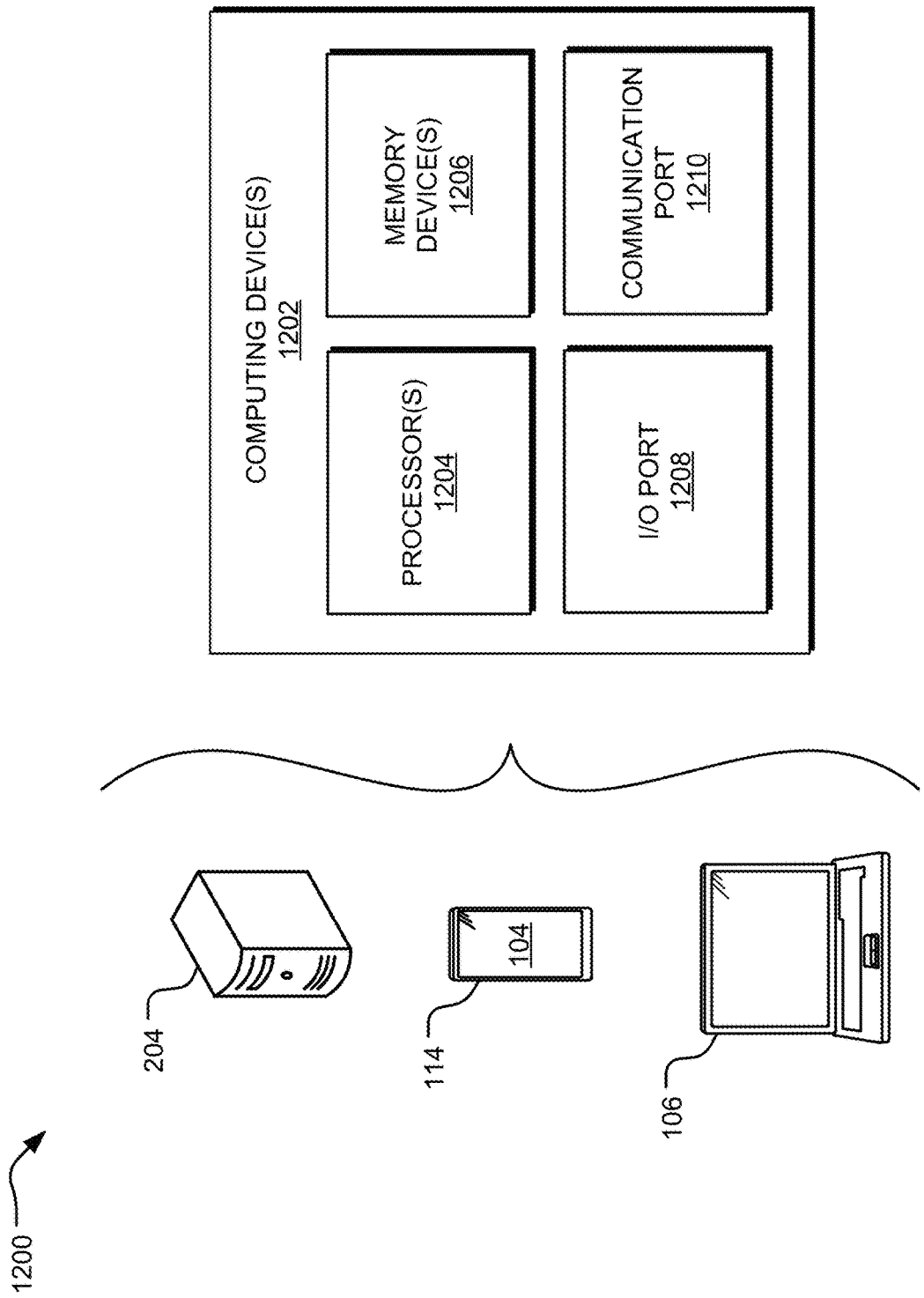
1200
COMPUTING DEVICE(S)
1202
PROCESSOR(S)
1204
MEMORY
DEVICE(S)
1206
I/O PORT
1208
COMMUNICATION
PORT
1210
204
104
114
106

FIG. 12

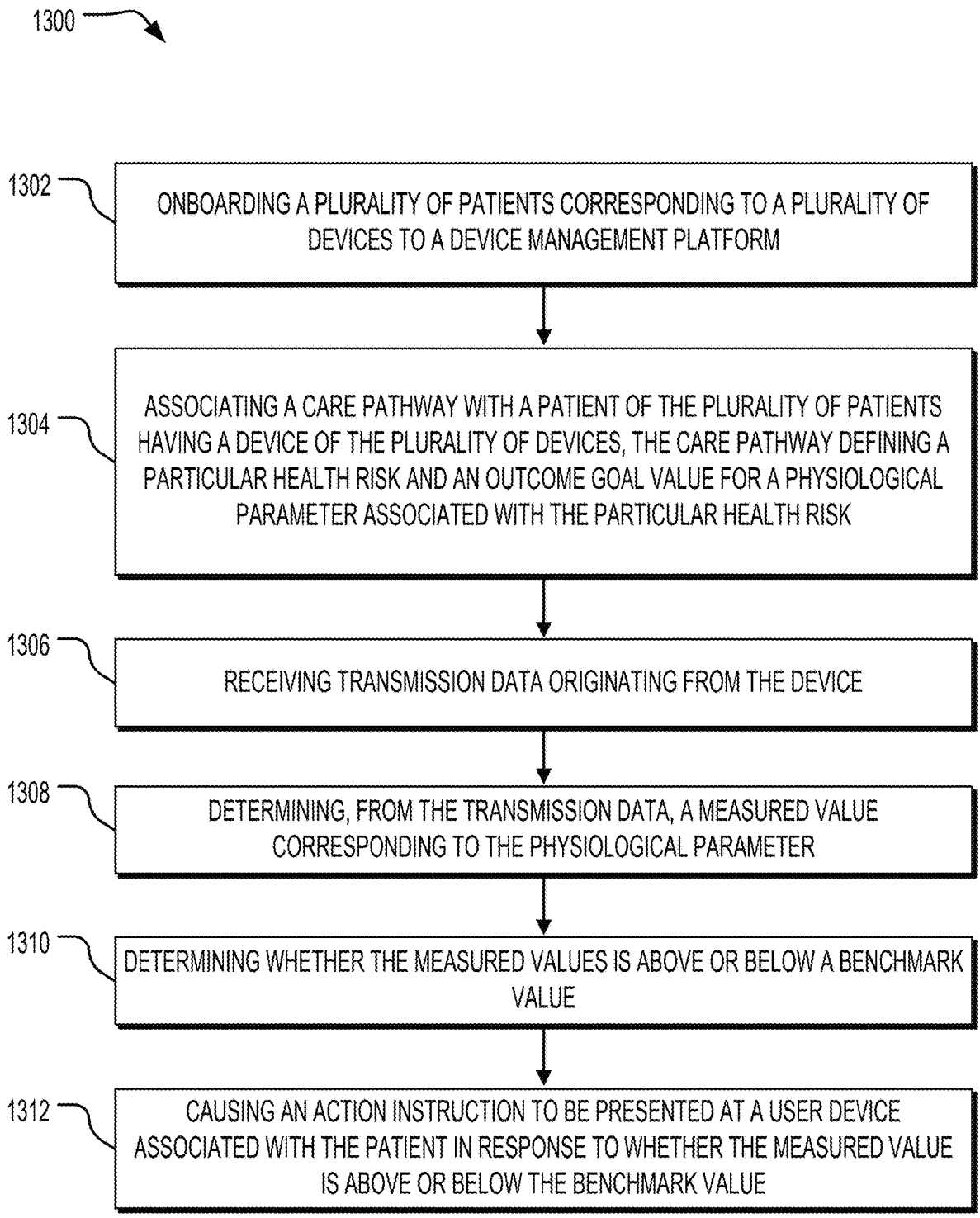
1300
1302
ONBOARDING A PLURALITY OF PATIENTS CORRESPONDING TO A PLURALITY OF DEVICES TO A DEVICE MANAGEMENT PLATFORM
1304
ASSOCIATING A CARE PATHWAY WITH A PATIENT OF THE PLURALITY OF PATIENTS HAVING A DEVICE OF THE PLURALITY OF DEVICES, THE CARE PATHWAY DEFINING A PARTICULAR HEALTH RISK AND AN OUTCOME GOAL VALUE FOR A PHYSIOLOGICAL PARAMETER ASSOCIATED WITH THE PARTICULAR HEALTH RISK
1306
RECEIVING TRANSMISSION DATA ORIGINATING FROM THE DEVICE
1308
DETERMINING, FROM THE TRANSMISSION DATA, A MEASURED VALUE CORRESPONDING TO THE PHYSIOLOGICAL PARAMETER
1310
DETERMINING WHETHER THE MEASURED VALUES IS ABOVE OR BELOW A BENCHMARK VALUE
1312
CAUSING AN ACTION INSTRUCTION TO BE PRESENTED AT A USER DEVICE ASSOCIATED WITH THE PATIENT IN RESPONSE TO WHETHER THE MEASURED VALUE IS ABOVE OR BELOW THE BENCHMARK VALUE

FIG. 13

SYSTEMS AND METHODS TO MONITOR PATIENT DEVICES

FIELD

Aspects of the presently disclosed technology relate generally to patient device monitoring and, more particularly, to systems and methods for remotely monitoring one or more cardiac implantable electronic devices.

BACKGROUND

Implantable medical devices are regularly used to treat and/or monitor a variety of medical conditions. For example, cardiac implantable electronic devices (CIED), such as implantable cardioverter defibrillators (ICDs) are often utilized to regulate and monitor cardiac functions. CIEDs may include, without limitation: pacemakers (PMs), which prevent slow heart rates using low-energy electrical pulses; implantable cardioverter defibrillators (ICDs), which are used to detect abnormal heart arrhythmias and deliver life-saving shocks to prevent sudden cardiac arrest; implantable loop recorders (ILRs) and implantable cardiac monitors (ICMs), which continuously monitor cardiac data and transmit data to the clinic as prescribed by a clinician and at the patient's discretion; and the like. Such CIEDs store and may periodically transmit information relating to the operation of the device outside the body for analysis, programming, and/or the like. More particularly, CIEDs store and transmit information for in-office or remote monitoring by a medical provider.

However, medical providers operating clinics are often responsible for a large number of patients having a wide range of devices. The patients can have different levels of technological sophistication and often follow different care plans. These clinics are responsible for tracking the care plan activity to ensure billing requirements for monitoring periods are satisfied. However, this process is made tedious and complex by the variety of health monitoring devices available to consumers which has rapidly increased the amount of health-related data being generated. Challenges in managing devices from the clinic perspective are further compounded by the variety of different billing requirements for different care plans. The care plan for the patient can be negatively impacted and the clinic can lose revenue if the clinic fails to meet the complex array of monitoring interval requirements (e.g., by missing required data upload dates, failing to follow up, etc.).

It is with these observations in mind, among others, that various aspects of the present disclosure were conceived and developed.

SUMMARY

Implementations described and claimed herein address the foregoing problems by providing systems and methods for remote patient monitoring. In some examples, a method to manage patient devices comprises: associating a care pathway with a patient having a patient device, the care pathway defining: a particular health risk and an outcome goal value for a physiological parameter associated with the particular health risk; an outcome goal date associated with the outcome goal value; and one or more benchmark dates corresponding to one or more one or more benchmark values of the physiological parameter, the one or more benchmark dates and one or more benchmark values being based at least partly on the outcome goal value and the outcome goal date; receiving transmission data originating from the patient device; determining, from the transmission data, a measured value corresponding to the physiological parameter; determining whether the measured value is above or below a benchmark value of the one or more benchmark values; and causing an action instruction to be presented at a user device associated with the patient in response to whether the measured value is above or below the benchmark value.

In some instances, the user device is a mobile device that captures the transmission data from the patient device and transmits the transmission data to a device management platform device remote from the mobile device. Additionally, the care pathway can be defined by one or more billing codes as one or more of: a remote patient monitoring pathway; a chronic care management pathway; a primary care management pathway; a transitional care management pathway; a remote therapy monitoring pathway; or a heart failure pathway. Moreover, the physiological parameter can be one or more of: an amount of a physical activity; a heart rate; an amount of a sleep activity; a blood oxygen saturation; or an electrocardiogram (ECG) measurement. The transmission data can be first transmission data from a first device being the user device, and the method can further comprise receiving second transmission data from a second device, the second transmission data including: a measured weight value; a measured blood pressure value; a measured glucose value; or a measured temperature value. Furthermore, the second device can be: a Bluetooth device to send the second transmission data to the user device for transmission to a device management platform device; or a cellular device to send the second transmission data to the device management platform device.

In some examples, the method further includes determining that a monitoring period, associated with one or more of a first benchmark date of the one or more benchmark dates or the outcome goal date, has completed; receiving a clinician input, at a clinic user interface (UI), corresponding to the monitoring period that has completed; and generating, in response to the clinician input, a report for the monitoring period. The monitoring period can be based on one or more of a Current Procedural Terminology (CPT) billing code or a Center for Medicare and Medicaid Services (CMS) billing code. Additionally, the clinician input can be a first clinician input and the method can further comprise: receiving, at the clinic UI, a second clinician input indicating whether the monitoring period is a 30-day monitoring period or a calendar month monitoring period. The method can further comprise determining a medication consumption date associated with the patient, wherein: the transmission data is received after the medication consumption date; and the benchmark value is at least partly based on the medication consumption date.

In some examples, a method to manage a patient device comprises: associating a care pathway with a patient having a device based on a clinician input received at a clinic user interface (UI), the care pathway defining: a particular health risk associated with one or more physiological parameters; and one or more predetermined threshold values corresponding to the one or more physiological parameters; receiving transmission data originating from the patient device; determining, from the transmission data, a measured value corresponding to a physiological parameter of the one or more physiological parameters; determining whether the measured value is above or below a predetermined threshold value of the one or more predetermined threshold values; presenting an indication of whether the measured value is above the predetermined threshold value at the clinic UI;

and causing an action instruction to be presented at a patient UI displayed at a user device associated with the patient in response to whether the measured value is above or below the predetermined threshold value.

Furthermore, in some instance, the action instruction indicates an amount of steps to be walked for a number of one or more days. The clinician input can be a first clinician input, and the method can be further comprise: receiving a second clinician input at the clinic UI indicating the predetermined threshold value; storing the predetermined threshold value at a device management platform storage device in response to the second clinician input; and retrieving the predetermined threshold value from the device management platform storage device to determine whether the measured value is above or below the predetermined threshold value. Moreover, the method can further comprise receiving a third clinician input at the clinic UI in response to presenting the indication of whether the measured value is above the predetermined threshold value, causing the action instruction to be presented at the patient UI is in response to the third clinician input. Additionally, the method can comprise receiving an updated data transmission in response to causing the action instruction to be presented at the patient UI.

In some examples, a method to manage an patient device comprises: associating a plurality of care pathways with a plurality of patients having a plurality of patient devices, a care pathway of the plurality of care pathways defining: a particular health risk for a patient of the plurality of patients, the particular health risk being associated with one or more physiological parameters; and one or more predetermined threshold values corresponding to the one or more physiological parameters; receiving transmission data originating from the plurality of patient devices; receiving, at a clinic user interface (UI), a first clinician input selecting a patient identifier corresponding to the patient; determining, from the transmission data and in response to the first clinician input, a measured value corresponding to a physiological parameter of the one or more physiological parameters for the patient; presenting, at the clinic UI, an indication of whether the measured value is above or below a predetermined threshold value of the one or more predetermined threshold values; and causing an action instruction to be presented at a patient UI displayed at a user device associated with the patient in response to a second clinician input at the clinic UI.

In some examples, the action instruction is a first action instruction, and the method further comprises: determining user device parameters of the user device associated with the patient; determining that the user device parameters fail to satisfy a device requirement associated with the care pathway; and causing, in response to the user device parameters failing to satisfy the device requirement, one or more of: a second action instruction to be presented at the patient UI displayed at the user device; or a complimentary device to be shipped to a physical address associated with the patient identifier. The method can further comprise: receiving, a third clinician input at the clinic UI; and presenting, in response to the third clinician input, a patient profile including two or more of: a device type or parameter of the user device; the care pathway associated with the patient; a device requirement associated with the physiological parameter defined by the care pathway; a latest measured value associated with an outcome goal; or an indication of whether the measured value is greater than a benchmark value. Additionally, the method can comprise: determining a Current Procedural Terminology (CPT) billing code associated with the care pathway; determining a monitoring period associated with the CPT billing code, the one or more predetermined threshold values including a benchmark value for the monitoring period; determining a data transmission schedule corresponding to the monitoring period; and causing the user device to transmit the transmission data according to the data transmission schedule. Finally, the CPT billing code can be a first CPT billing code, and the method can further comprise: determining that clinician activity or a data transmission fails to satisfy a first requirement of the first CPT billing code for the monitoring period; and in response to the clinician activity or a data transmission failing to satisfy the first requirement of the first CPT billing code, determining that the clinician activity or the data transmission satisfies a second requirement of a second CPT billing code for the monitoring period; and generating a report corresponding to the second CPT billing code instead of the first CPT code for the monitoring period.

Other implementations are also described and recited herein. Further, while multiple implementations are disclosed, still other implementations of the presently disclosed technology will become apparent to those skilled in the art from the following detailed description, which shows and describes illustrative implementations of the presently disclosed technology. As will be realized, the presently disclosed technology is capable of modifications in various aspects, all without departing from the spirit and scope of the presently disclosed technology. Accordingly, the drawings and detailed description are to be regarded as illustrative in nature and not limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an example system for managing patient devices using a device management platform.

FIG. **2** illustrates an example system for managing patient devices using a device management platform with a workflow generator, which can form at least a portion of the system of FIG. **1**.

FIG. **3** illustrates an example system for managing patient devices using a data flow performed by the device management platform, which can form at least a portion of the system of FIG. **1**.

FIG. **4** illustrates an example system for managing patient devices including a patient enrollment and setup process, which can form at least a portion of the system of FIG. **1**.

FIG. **5** illustrates an example system for managing patient devices including a billing pathway creation process, which can form at least a portion of the system of FIG. **1**.

FIG. **6** illustrates an example system for managing patient devices including a device management and/or dispatching procedure, which can form at least a portion of the system of FIG. **1**.

FIG. **7** illustrates an example system for managing patient devices using a care pathway and a billing pathway, which can form at least a portion of the system of FIG. **1**.

FIG. **8** illustrates an example system for managing patient devices using a parameter monitoring interface section of a clinic user interface, which can form at least a portion of the system of FIG. **1**.

FIG. **9** illustrates an example system for managing patient devices using a goal tracker bar of a clinic user interface, which can form at least a portion of the system of FIG. **1**.

FIG. **10** illustrates an example system for managing devices using a parameter status interface of a patient user interface, which can form at least a portion of the system of FIG. **1**.

FIG. **11** illustrates an example system for managing patient devices using a workflow interface of a clinic user interface, which can form at least a portion of the system of FIG. **1**.

FIG. **12** illustrates an example system for managing patient devices using one or more computing systems, which can form at least a portion of the system of FIG. **1**.

FIG. **13** illustrates an example method for managing patient devices with the device management platform, which can be performed by the system of FIG. **1**.

DETAILED DESCRIPTION

Aspects of the present disclosure involve systems and methods for managing patient devices using a device management platform. The device management platform can provide multiple services to a clinic system in communication with a patient system to improve the effectiveness of procedures performed by the clinic system, resulting in improved care to the patient as well as increased revenue for the clinic.

For instance, the device management platform can determine outcome goal values and outcome goal dates, with multiple benchmarks, corresponding to measured physiological parameters of the patient. These can be particularized for the patient based on a type of health risk being monitored, a care pathway defined for the patient, and/or a monitoring interval requirement defined by a billing procedure. As such, the device management platform can aggregate and analyze transmission data received from the patient system to determine whether an amount of data transmissions (e.g., and/or a schedule of data transmissions) satisfies a billing requirement for a particular monitoring period, and to determine whether physiological parameters for the patient are improving at the rate intended by the care plan. Based on these determinations, the device management platform can cause various action instructions to be generated or presented at a patient user interface (UI) and/or a clinic UI as to intervene in the care plan.

Furthermore, the device management platform can generate a workflow interface at the clinic system (e.g., the clinic UI) based on the care pathway, a billing pathway, the outcome goal values and dates, the benchmarks, and the measured physiological parameters. The workflow interface can present this data and other data of the device management platform in an intuitive manner that can be easily navigated by clinic personnel to perform device monitoring and management tasks. For instance, the workflow interface can include a parameter monitoring interface section, a goal tracker bar, and other features to simplify the complex aggregation of these different types of data.

Accordingly, workflow processes of the clinic system for monitoring and tracking patient care can be made more efficient while reducing the likelihood of errors (e.g., missed clinic actions, missed patient actions, missed deadlines, etc.). This results in improved care for the patient and increased revenue for the clinic alike. Moreover, the device management platform can collect data related to patient outcomes to determine which clinic processes and/or patient system characteristics correlate to improved patient outcomes. Data can also be collected related to clinic actions to provide insights into clinic action trends that result in improved patient care and/or increased revenue. Additional advantages will become apparent from the disclosure herein.

FIG. **1** illustrates an example system **100** including a device management platform **102** for managing one or more patient devices **104** of one or more patients. The device management platform **102** can be one or more of an application, a Software-as-a-Service (SaaS) and/or a cloud-based service or remotely provided service. For instance, one or more clinic system(s) **106** can download an application from a server of the device management platform **102** and/or can interact with a web portal provided by the device management platform **102** to receive access to the device management platform **102**. In some examples, the device management platform **102** provides one or more onboarding procedure(s) **108** such as a clinic onboarding process for the clinic system(s) **106** to integrate clinic data (e.g., patient data **110** such as patient records, other patient data **110**, clinic personnel data, relevant billing codes, etc.) into a cardiac device management service provided by the device management platform **102**. The onboarding process for the clinic system(s) **106** can also include building out various workflows **112** corresponding to the patients based on various factors, as discussed in greater detail herein.

In some examples, the system **100** includes one or more patient system(s) **114**. The patient system(s) **114** can include the patient device(s) **104**, which can include at least one of: a mobile device, a wearable device, a smart watch, a CIED, an ICD, a PM, an ILR, an IMC, a blood testing cuff, a blood pressure cuff, an activity tracker, a blood pressure monitor, a continuous glucose monitoring (CGM) device, a glucometer, a heart rate monitor a heart rate/blood pressure device, a peak flow meter, a pulse oximeter, a scale, a sleep tracker, a thermometer, an Internet-of-Things (IoT) device, and the like. The patient device(s) **104** can be a single device or can include multiple devices (e.g., a primary device in communication with a secondary device **116**) to create and/or send transmission data **118**. In one embodiment, the secondary device **116** can be a mobile device and/or wearable device of the patient which receives transmission data **118** from a CIED via a Bluetooth®, Wi-Fi, or other local area network connection.

The patient device(s) **104** can send the transmission data **118** to the device management platform **102** and/or the clinic system **106**. The transmission data **118**, which can originate at the patient device **104** (e.g., and/or another device, such as the secondary device **116**, an Internet-of-Things, a wearable device, combinations thereof, and the like) and can include data representing measurements of one or more physiological parameters, such as a heart rate, an amount of physical activity, an amount of sleep activity or an indication of sleep deprivation, a blood oxygen saturation level, an electrocardiogram (ECG) measurement, a body temperature, a body weight, a glucose level, and the like. These measured physiological parameter(s) **120** can be captured and time-stamped in the transmission data **118** and sent to one or both of the device management platform **102** and/or the clinic system(s) **106**. In some instances, measured physiological parameter(s) **120** data can be pulled from the patient system **114** periodically according to a transmission schedule and/or manually in response to a request. In some examples, different types of data may have different data pull schedules (e.g., a blood pressure data type can be pulled multiple times a day whereas a body weight data type can be pulled once a day or once a week, etc.).

Accordingly, the device management platform **102** and/or the clinic system(s) **106** can use the measured physiological parameter(s) **120** to determine whether the patient is on track to meet an outcome goal associated with a particular health risk and/or whether any workflow actions can be taken to increase a likelihood of meeting the outcome goal, ultimately improving care for the patient.

Moreover, the device management platform **102** can improve the clinic system(s) **106** by providing workflows **112** corresponding to the patients of the clinic system **106** with a workflow generator **122**. The workflow generator **122** can use various inputs to generate goal outcomes associated with the patient, benchmarks calculated based on the goal outcome, care pathways, billing pathways, and other features of the device management platform **102** used to track, monitor, organize, and utilize the transmission data **118** to provide patient care, as discussed in greater detail below. By presenting the outputs of these features of the workflow generator **122** at a clinic user interface (UI) **124**, the device management platform **102** can streamline many internal processes for the clinic, improving clinic efficiency while reducing clinic errors and lost billing opportunities. The device management platform **102** can present information at the clinic UI **124** incorporating patient data **110** (e.g., identification information, biological information, health information, and the like), the measured physiological parameters **120**, as well as various components of the workflow **112** (e.g., goal outcomes, benchmarks, care pathways, billing pathways, etc., as discussed in greater detail below). Additionally, the device management platform **102** can generate an intuitive interface with multiple filters and analysis capabilities to keep clinic personnel up-to-date on actions needed (e.g., by the clinic personnel and/or the patient) to manage the patient device **104** and provide patient care for the cardiac device patient consistent with clinic standards, industry standards, and billing codes. Additional benefits are discussed below.

Turning to FIG. **2**, an example system **200** for managing the patient device(s) **104** is depicted, which can form at least a portion of the system **100** depicted in FIG. **1**. The system **200** can include the device management platform **102**, stored at one or more database(s) **202** and/or executed by one or more servers **204**, to generate and/or present various workflow components at the clinic system **106**, as discussed in greater detail below.

As noted above, the device management platform **102** can be provided as a cloud-based service, as a locally-stored application at the clinic system **106**, and combinations thereof. As such, the database(s) **202** and/or the server(s) **204** of the device management platform **102** can be located remote from the clinic systems **106** but can also include hardware components at the clinic systems **106**. Similarly, software components of the device management platform **102**, such as the workflow **112** discussed herein, can be hosted remotely at the database(s) **202** and executed remotely by the server **204**, and/or hosted and executed locally at the clinic system(s) **106**. The database(s) **202** can store any of the data files and/or software instructions discussed herein, including associations between these different data files. Moreover, the data in the database(s) **202** can be aggregated and associated with clinic profiles associated with the clinic system **106**, clinic site profiles corresponding to sites of the clinic system **106**, and/or patient profiles associated with the patient system **114** to perform the operations discussed herein (e.g., to generate the UIs, filtering, and/or analytics services). The one or more server device(s) **204** may be a single server, a plurality of servers with each such server being a physical server or a virtual machine, or a collection of both physical servers and virtual machines. The server(s) devices **204** may represent an instance among large instances of application servers in a cloud computing environment, a data center, or other computing environment. The one or more databases **202** and/or the one or more server device(s) **204** can form at least a portion of a computing system of the device management platform **102**, as discussed below regarding FIG. **12**.

In some examples, the patient system(s) **114** can communicate with the device management platform **102** and/or the clinic system(s) **106** by connecting to one or more network(s) **206**. The network(s) **206** can be one or more of a local area network (LAN) (e.g., Wi-Fi, Bluetooth®, Near Field Communication (NFC), etc.) a wide area network (WAN) (e.g., ethernet, fiber, Internet-of-Things (IoT), the Internet, etc.), a cellular network (e.g., third generation (3G), fourth generation (4G), Long-Term Evolution (LTE), fifth generation (5G), etc.), and the like.

In some instances, the device management platform **102** can generate the workflow **112** to include multiple workflow components, attributes, and pathways, and care plans, and can present these at the clinic system **106** via the clinic UI **124**. For instance, the workflow **112** can determine one or more health risk(s) **208** (e.g., health issue indications) associated with a particular patient for which the workflow **112** is generated. The health risks **208** can include hypertension, post ablation, heart failure, chronic obstructive pulmonary disease (COPD), being overweight, being sleep deprived, and/or combinations thereof. the different health risks **208** can each correspond to a different care plan. In some instances, medical personnel can input a first health risk as a primary indication or primary health risk for the patient (e.g., hypertension, post ablation, heart failure, and/or COPD) and a second health risk as a secondary indication or a secondary health risk for the patient (e.g., being overweight or being sleep deprived.). The care plans for the primary and/or secondary health risks can be used by the device management platform **102** for various downstream processes of generating workflow attributes, care pathways **210**, action instructions **212**, and the like, as discussed in greater detail below.

In some examples, the device management platform **102** can generate the workflow **112** to include one or more care pathways **210**. The care pathways **210** can be based on industry defined procedures corresponding to how the clinic engages with the patient, and can integrate the patient data **110**, measured physiological parameter(s) **120**, and various inputs from medical personnel at the clinic UI **124** into a care plan with defined benchmarks, outcomes, and data flows to implement such strategies. A single care pathway **210** can include multiple care plans and, inversely, a single care plan can include multiple care pathways **210**. For a particular care pathway **210** to address a particular health risk **208** (e.g., hypertension), the workflow generator **122** can determine one or more outcome goal values **214**. The outcome goal value **214** can be a value for the measured physiological parameter(s) **120** (e.g., blood pressure) corresponding to the health risk **208** of the care pathway **210** (e.g., hypertension). The one or more outcome goal values **214** can be considered a healthy value and can be an intended value to be achieved as an outcome of the workflow **112** for the care pathway **210**. The outcome goal values **214** can be based on industry-recognized healthy values for the physiological parameters, such as a target average blood pressure for reducing the hypertension health risk **208**, and the like. The various care pathways **210** are discussed in greater detail below regarding FIG. **5**. Additionally or alternatively, the outcome goal value(s) **214** can be determined or set based on input received at the clinic UI **124** (e.g., by clinic personnel) and/or input received at a patient UI **216** of the patient system(s) **114**.

In some instances, the outcome goal value(s) **214** can be associated with one or more outcome goal dates **218** (e.g.,

indicating an end of a monitoring period or multiple monitoring periods), by which the physiological parameter is to be at or below the one or more outcome goal values **214**. The one or more outcome goal dates **218** can be based on a variety of factors, such as an initial measured value for the physiological parameter corresponding to the one or more outcome goal values **214**, a difference between the initial measured value and the one or more outcome goal values **214**, a selected rate of change, a selected amount of change per month, a monitoring period defined by a billing code, or combinations thereof. Furthermore, the care plan can include one or more benchmark values **220** associated with one or more benchmark dates **222**. The benchmark values **220** can be based on the outcome goal values **214** and the outcome goal dates **218** and can represent incremental steps to reaching the one or more outcome goal values **214**. The one or more benchmark values **220** and benchmark dates **222** can be determined by first determining the difference between the initial measured value and the outcome goal value **214**, then dividing this difference by a number of monitoring periods until the outcome goal date **218**. For example, the outcome goal date **218** may be one year from a starting date, and the benchmark dates **222** can be the end of each calendar month to define twelve monitoring periods until the outcome goal date **218**. In some examples, the clinic UI **124** can receive an input defining whether the monitoring period is a calendar month or a 30-day period. In examples where the health risk **208** is hypertension, outcome goal values **214** can be systolic blood pressure of 120 mm Hg and diastolic blood pressure of 80 mm Hg. If the difference between the initial measured value and these outcome goals value **214** is 60 mm Hg, the benchmark values **220** can be determined by dividing the difference by the number of monitoring periods (e.g., benchmark dates **222**) which, in this example, provides incremental benchmark values of 5 mm Hg per monthly monitoring period. As discussed in greater detail below, the device management platform **102** can present this care plan information at the clinic UI **124** to improve patient care. For instance, the device management platform **102** can use the one or more outcome goal values **214**, the one or more outcome goal dates **218**, the one or more benchmark values **220**, and the benchmark dates **222** to determine when to generate and send action instructions **212**.

In some examples, the patient system **114** includes the patient device **104**, the secondary device **116** (e.g., mobile phone), and various other devices, such as wearable devices, IoT devices, tablets, and the like. The hardware and software components of these devices comprising the patient system(s) **114** can include various device specifications **224**. For instance, the various device specifications **224** can include one or more sensors in the patient device(s) **104** and/or the secondary device **116** (e.g., a motion sensor, a temperature sensor, etc.), a connectivity capability (e.g., Wi-Fi, Bluetooth®, or cellular such as Fourth Generation (4G) or Fifth Generation (5G)), an operating system compatibility, a memory capacity, a processing power (e.g., an of random-access memory (RAM)), and the like. From the device specifications **224** (e.g., and other information, as discussed below), the device management platform **102** can determine a technology tier corresponding to the patient and, based on the technology tier, can generate one or more action instructions **212** (e.g., to procure a particular device). The device management platform **102** can also generate and/or present one or more billing pathways **226**, which can integrate with the care pathways **210** to form the workflow **112** and create billing opportunities.

FIG. **3** illustrates an example system **300** to manage the patient device(s) **104**, which can form at least a portion of the system **100** of FIG. **1**. FIG. **3** illustrates a data flow of the system **300** that includes the one or more onboarding procedures **108**, the workflow **112**, and an analytics and reporting process **302**. The components of the device management platform **102** depicted in FIG. **3** are discussed in greater detail throughout this disclosure.

In some examples, the onboarding procedure **108** can include an education operation **304**. At the education operation **304**, the device management platform **102** can provide information to the clinic system **106** educating the clinic personnel on techniques for monitoring the patient device(s) **104**, such as the various features of the device management platform **102** discussed herein. The one or more onboarding procedure(s) **108** can also include a patient population identification operation **306** in which patient populations for the clinic are identified (e.g., based on the patient data **110** that is stored at the system(s) **106**). Furthermore, the one or more onboarding procedure(s) **108** can include a platform onboarding process **308**, in which an application is installed at the clinic system **106** and/or web portal access to the clinic UI **124** is established, and various patient data **110** and billing codes are integrated into the device management platform **102**. Following the platform onboarding process **308**, the device management platform **102** can perform a patient enrollment and setup process **310** to collect additional patient data **110** and associate the patient(s) identified at the patient population identification operation **306** with one or more workflows **112**. The patient enrollment and setup process **310** can include importing data from an electronic medical records (EMR) and/or manually entering the patient data **110**. The patient data **110** can include personal data (e.g., the full patient name, date of birth, sex, contact information, etc.), as well as medical data when the patient gives such consent (e.g., an enrollment date, a list of medications, a diagnosis, vital signs, a medical history, a medical diagnosis, an immunization date, an allergy, one or more lab test results, and the like).

The patient data **110** can also include one or more technology tiers associated with the patient. The technology tiers can indicate a technological capability of the user based on other patient data **110** as well as other types of data, such as the various device specifications **224**. The technology tiers can indicate what technology capabilities (e.g., types of sensor data) are required at the patient system **114** to provide the input data to the care pathway **210** and/or the billing pathway **226**. For instance, the device management platform **102** can determine technology requirements for the care pathway **210** and/or the billing pathway **226**, such as a Wi-Fi requirement, a cellular signal requirement, a blood test requirement, and/or a smart phone requirement. The technology tier can include information of an additional contact person for the patient, including their technology capabilities and contact information. Some of the technology capabilities and devices of the patient that can be indicated by their technology tier can be a type of smart watch, a blood testing cuff, a blood pressure cuff, an activity tracker, a blood pressure monitor, a continuous glucose monitoring (CGM) device, a glucometer, a heart rate monitor a heart rate/blood pressure device, a peak flow meter, a pulse oximeter, a scale, a sleep tracker, a thermometer, and the like. By defining various technology tiers for the patient, the device management platform **102** can determine whether the patient is using or has access to any of these devices, and whether any of these devices are needed by the data requirements of the care pathways **210** and/or the billing pathway **226**. Accord-

ingly, if it is determined that the technology tier requires a device capability that is lacking, the device management platform **102** can send an action instruction **212** to the patient system **114** to procure these devices and/or an instruction to cause any of these devices to be delivered to a location associated with the patient system **114**.

In some instances, the device management platform **102** can generate the workflow **112** following the one or more onboarding procedure(s) **108** to monitor and manage the patient device **104** of the patient enrolled during the patient enrollment and setup process **310**. The workflow **112** can include a tracking and monitoring process **312** performed during the monitoring period and/or multiple monitoring periods and an end of period reporting process **314** for generating a report corresponding to the monitoring period (e.g., in response to the outcome goal date **218** occurring or the benchmark date **222** occurring). The tracking and monitoring process **312** is discussed in greater detail below. In some examples, the workflow **112** can include a billing process **316**, which can be defined by the one or more billing pathways **226** integrated into the workflow **112** and/or the care pathway **210**. In some instances, the device management platform **102** can perform one or more billing period iterations **318** in which the tracking and monitoring process **312**, the reporting process **314** and the billing process **316** are repeated for a series of sequential monitoring periods (e.g., corresponding to the benchmark dates **222**). The workflow **112** can include a patient exiting step **320** to occur once the outcome goal value **214** is reached, the outcome goal date **218** occurs, and/or another action occurs to end the workflow **112** with respect to the patient and a particular care plan. Once the workflow **112** for the patient is complete (e.g., and/or concurrently with the workflow **112**), the device management platform **102** can perform the analytics and reporting process **302**. The analytics and reporting process **302** can generate analytics corresponding to the patient enrolled at the patient enrollment and setup process **310**, the plurality of patients identified at the patient population identification operation **306**, the clinic itself, a particular site or a plurality of sites of the clinic, and/or a plurality of clinics, as discussed in greater below regarding FIG. **11**.

FIG. **4** illustrates an example system **400** to manage the patient device(s) **104**, which can form at least a portion of the system **100** of FIG. **1**. The system **400** depicted in FIG. **4** can include at least the patient enrollment and setup process **310** which can use communications between the patient system **114** and the clinic system **106** to bring the patient data **110** into the device management platform **102** and initiate the workflow **112**.

In some examples, the patient enrollment and setup process **310** can include one or more messages sent between the clinic system **106** (e.g., a clinic web application **402** executing at the clinic system **106**) and the patient system **114** (e.g., a mobile device or user device application **404** executing at the secondary device **116**) via the network **206**. The patient enrollment and setup process **310** (e.g., and any of the clinic system **106** processes discussed herein) can begin by generating and presenting a clinic login prompt **406** at the clinic UI **124** to receive clinic credentials and provide access to the device management platform **102**. A create patient prompt **408** can be created and presented (e.g., in response to a clinician user input) to receive patient data **110** such as a first name, a last name, a date of birth, a sex, a gender, a phone number, and/or an email). In response to a clinician user input submitting a create patient request, a message **410** (e.g., an email, a text message, etc.) can be generated and sent to the patient system **114**, for instance, presented at the patient UI **216** generated by the user device application **404**. A patient login prompt **412** and/or a device sync option **414** can be presented at the patient UI **216** at the secondary device **116** (e.g. a mobile device, a wearable device, a smart watch, smart glasses, etc.) to cause the secondary device **116** to establish a communication session with the patient device **104** and/or to cause the device(s) **104** to send transmission data **118** (e.g., including the measured physiological parameter(s) **120**) to the secondary device **116**. A patient input selecting the device sync option **414** can also establish one or more transmission schedules or extra transmissions, for instance, as part of an initial patient onboarding process and/or in response to an action instruction **212** (e.g., generated according to the care pathways **210**). The patient UI **216** can also present health metrics and one or more patient reports via the user device application **404**, which can include most recent measured physiological parameter(s) **120** and/or historical measured physiological parameter(s) **120** (e.g., corresponding to activity, heart rate, an ECG, an oxygen saturation reading, an amount of sleep, a blood pressure, etc.). A patient input at the patient UI **216** can cause the patient device(s) **104** and/or the secondary device **116** to update the clinic system **106** with the latest transmission data **118** of measured physiological parameter(s) **120**. In response, the clinic system **106** can receive the transmission data **118** and present, at the clinic UI **124**, data related to the care plan including the measured physiological parameter(s) **120** with the patient data **110** and/or an indication of how the measured physiological parameter(s) **120** compares to the one or more outcome goal values **214** and/or the one or more benchmark values **220** (e.g., as a line graph with these threshold values shown presented as horizontal lines). The clinic web application **402** can also present the billing pathway **226** indicating how the transmission data **118** relates to the monitoring period for billing purposes (e.g., whether the transmission data **118** satisfies a monitoring interval requirement), as discussed in greater detail below.

FIG. **5** illustrates an example system **500** to manage the patient device(s) **104**, which can form at least a portion of the system **100** of FIG. **1**. The system **500** depicted in FIG. **5** can include a billing pathway creation process **502** for determining the billing pathways **226** for the care plan generated for the patient.

In some examples, the billing pathway creation process **502** occurs subsequently to and/or concurrently with determining the health risks **208** and corresponding care plans. The billing pathways **226** can be used to construct the care pathways **210** and, additionally or alternatively, billing pathways **226** can be selected based on the care pathways **210**. At the clinic system **106**, an input can select one or more billing pathways **226**, such as a remote patient monitoring pathway **504**, a chronic care management pathway **506**, a primary care management pathway **508**, a transitional care management pathway **510**, a remote therapy monitoring pathway **512**, a heart failure pathway **518**, and/or any combination of the billing pathways **226**. The different billing pathways **226** can correspond to one or more billing codes **520** that define billing requirements for the particular billing pathways **226**.

For instance, upon determining the billing pathway **226** for the patient (e.g., via a clinician input at the clinic system **106**), and the corresponding one or more billing codes **520**, the workflow generator **122** can generate various workflow attributes **522** for the workflow **112** corresponding to the billing pathway **226**. The billing pathway **226** can indicate a particular type of data transmission and/or transmission schedule needed to fulfill the billing requirements (e.g., for

insurance purposes) and whether the current devices of the patient can perform these functions, or whether a supplemental device request should be generated (e.g., device(s) needed **524**), as discussed below regarding FIG. **6**.

Moreover, the various workflow attributes **522** generated in response to the billing pathway **226** can include one or more interval periods **526** (e.g., the monitoring periods such as those defined by the outcome goal date **218**, the benchmark dates **222**, one or more intermediary interval periods, and the like). Additionally, the workflow attributes **522** can include one or more Current Procedural Terminology (CPT) codes **528** (+ICD-10 codes?). In some examples, a primary billing pathway can be determined corresponding to first CPT codes, and a secondary billing pathway or fall back billing pathway can be determined corresponding to second CPT codes. In some scenarios, clinic actions during the workflow **112** can fail to satisfy one or more requirements of the primary billing pathway, but can still satisfy the requirements of the secondary billing pathway. As such, the device management platform **102** can use the second CPT codes corresponding to the secondary billing pathway instead of the first CPT codes corresponding to the primary billing pathway. This technique can result in an improved workflow **112** with a higher amount of billing and billing efficiency relative to previous techniques.

FIG. **6** illustrates an example system **600** to manage the patient device(s) **104**, which can form at least a portion of the system **100** of FIG. **1**. The system **600** depicted in FIG. **6** can perform a device management and/or dispatching procedure **602** to generate and/or fulfill the supplemental device request discussed above.

For instance, the device management and/or dispatching procedure **602** can include receiving the billing pathway **226** established for a patient. The device management platform **102** can assess the data requirements of the care plan to determine device capability requirements **604** corresponding to the care pathway **210**. For instance, a care pathway **210** can include a hypertension care plan **606** established for the patient, and the device management platform **102** can determine that the hypertension care plan **606** has the device capability requirements **604** of a Bluetooth® scale and a blood pressure device or cuff. A post ablation care plan **608** can be established with a heart rate monitor as the device capability requirements **604**. A heart failure care plan **610** can be established with a smart watch (e.g., an apple watch) and the Bluetooth® scale as the device capability requirements **604**. A COPD care plan **612** can be established with a pulse oximeter as the device capability requirement **604**. An overweight care plan **614** can have a Bluetooth® scale as the device capability requirement **604**. A sleep deprived care plan **616** can have a Bluetooth® scale as the device capability requirement **604**. Moreover, other additional or customizable care plans **618** corresponding to a customizable health risk **208** can be added and/or customizable device capability requirements **604** can be added for the customizable care plan **618** (e.g., via input(s) at the clinic UI **124**).

After determining the one or more billing pathways **226**, care pathways **210**, care plans, and corresponding device capability requirements **604**, the device management platform **102** can compare these device capability requirements **604** to device capabilities of the patient, for instance, using the technology tier data discussed above. If the device management platform **102** determines that the technology tier of the patient does not fulfill the device capability requirements **604**, the device management platform **102** can order a supplemental device which does satisfy the device capability requirements **604** (e.g., via an order request API call to third-party e-commerce system or a device retailer system). If it is determined from the comparison of the device capability requirements **604** to the technology tier capabilities of the patient that the device capability requirements **604** can be provided by the patient devices (e.g., one or more secondary devices **116** already used by the patient), the device management platform **102** can assign the secondary device(s) **116** to the care pathway **210** to satisfy the device capability requirements **604**. In addition to ordering and/or assigning supplemental devices to provide the device capability requirements **604** for the care pathways **210**, the device management platform **102** can set one or more device attributes of the supplemental device. For instance, the device management platform **102** can generate and/or send one or more API calls to application(s) operating on the supplemental device(s) (e.g., the secondary device **116**) to initiate a data collection and/or transmission process for the applications (e.g., a health application, an exercise application, a heart monitoring application, an oxygen saturation application, a body motion detection application, a location tracking application, and the like). Primary and/or secondary supplemental device(s) collecting data (e.g., sensor data) to transmit via the transmission data **118** can include one or more of the smart watch (e.g., the apple watch), the Bluetooth® scale, the blood pressure cuff, an activity tracker, a continuous glucose monitor (CGM), a glucometer, a heart rate and/or blood pressure monitor, a peak flow meter, a pulse oximeter, a scale (e.g., a network-connected scale), a sleep tracker, a thermometer, and combinations thereof.

FIG. **7** illustrates an example system **700** to manage the patient device(s) **104**, which can form at least a portion of the system **100** of FIG. **1**. The system **700** depicted in FIG. **7** can generate and present a workflow **112** that implements the billing pathway **226** and the care pathways **210** (e.g., with corresponding care plans) to generate patient outcomes corresponding to the one or more outcome goal values **214**.

In some examples, the workflow **112** can have defined health goals **702** for the different care plans that correspond to the one or more outcome goal values **214** relative to a base line value. For instance, the hypertension care plan **606** can have one or more health goals **702** such as increased activity, reduced blood pressure, and reduced stress. These health goals **702** can correspond to the one or more outcome goal values **214**, such a particular amount of steps or movement, a particular blood pressure value (e.g., systolic 120 mm Hg and diastolic 80 mm Hg), and/or other measured physiological parameter(s) **120** that relate to the health goals **702** of increased activity, reduced blood pressure, and/or reduced stress. The post ablation care plan **608** can have health goals **702** of reduced blood pressure, reduced body weight, reduced alcohol consumption, and/or reduced smoking relative to baseline values. The heart failure care plan **610** can have the health goals **702** of increased physical activity and increased oxygen intake relative to baseline values. The COPD care plan **612** can have the health goals **702** of increased physical activity, improved diet, increased water intake, decreased smoking, and decreased stress relative to baseline values. The overweight care plan **614** can have the health goals **702** of increased physical activity and decreased body weight relative to baseline values. The sleep deprived care plan **616** can include the health goal **702** of an increased amount of sleep relative to the baseline value.

Upon defining the health goals **702**, the device management platform **102** can determine the one or more outcome goal values **214** and the outcome goal date **218**, for instance, as prescribed physical data points generated by the clinic

personnel (e.g., at the clinic UI **124**). This can include adding one or more benchmark values **220** and benchmark dates **222** and/or interventions (e.g., action instructions **212**) to the care plan, such as losing an amount of weight per week, walking an amount of steps by a particular date, taking an amount of beta-blockers each day, reaching a particular resting heart rate by a particular date, eliminating a particular diet item (e.g., red meat) for a number of months and/or increasing a particular diet item (e.g., leafy greens), reducing an amount of cigarettes smoked per day, taking a particular physiological measurement every day, and the like. One or more rationales for how the benchmark values and benchmark dates **222** relate to the goals can be added by the clinic personnel (e.g., indicating that a particular weight corresponds to a reduced blood pressure). Moreover, as discussed, above, these benchmark values **220** and/or outcome goal values **214** can be set as threshold values (e.g., by the clinic system **106**) corresponding to the outcome goal date **218** and the benchmark dates **222**. Additionally, the duration of the care plan can be set by the outcome goal date **218**.

As discussed above regarding FIG. **6**, the system **700** can perform a device management and dispatching procedure **602** to determine if a particular device is needed to satisfy the device capability requirements **604**. Once the device management platform **102** completes the device management and dispatching procedure **602** or otherwise determines that the device capability requirements **604** is satisfied, the device management platform **102** can perform the tracking and monitoring process **312**. The tracking and monitoring process **312** can include receiving the measured physiological parameter(s) **120** and comparing this data against the one or more benchmark values **220** and/or the one or more outcome goal values **214** to generate progress or status indicators. For instance, during the tracking and monitoring process **312**, the device management platform **102** can perform a goal value comparison or benchmark value comparison to determine whether the measured physiological parameter(s) **120** are above or below the one or more benchmark values **220** and the one or more outcome goal values **214**. Additionally, the tracking and monitoring process **312** can include collecting other information related to the patient, such as a report of symptoms (e.g., new symptoms). During the tracking and monitoring process **312**, the device management platform **102** can determine whether the data requirements for the care pathways **210** and the billing pathway **226** are satisfied and, if not, send one or more reminders or requests to the patient system **114** to send an updated data transmission.

The device management platform **102** can also detect any status changes related to the patient during the tracking and monitoring process **312**. For instance, the device management platform **102** can determine a type a medication, a date of medication consumption, and that the measured physiological parameter(s) **120** should be at particular value or within a particular range based on the medication and date of medication consumption. In other words, additional thresholds or benchmark values **220** can be determined or adjusted to measure an effectiveness of the medication consumption. Additionally or alternatively, the device management platform **102** can detect a number of office visits occurring during a monitoring period, which can be used to fulfill requirements of the billing pathway **226** and/or the care pathways **210**. Moreover, one or more messages can be sent to the patient system **114** and/or the clinic system **106** to provide communications indicating statuses and progress of the care plan. The messages can be customizable (e.g., created by clinic personnel) and can include indications of the care plan progress or status, the action instructions **212**, reminders, encouragement, or other information the clinic system **106** would like to transmit to the patient system **114** pursuant to causing the measured physiological parameter(s) **120** to reach the one or more benchmark values **220** and/or the one or more outcome goal values **214**.

Once a monitoring period is completed (e.g., 30 days has elapsed or a month has ended), the tracking and monitoring process **312** can determine if additional evidence is needed (e.g., additional data transmissions to fill data gaps, additional patient data **110** to inform the care pathways **210** or billing pathway **226**, or the like), and send a request to the patient system **114** for the additional information. Subsequently and/or concurrently with the tracking and monitoring process **312**, the device management platform **102** can perform a billing process, which can aggregate the clinic actions and patient actions detected during the tracking and monitoring process **312** (e.g., during the monitoring interval), compare those actions with particular billing code requirements of particular billing codes, and generate billing report(s) which can be completed and submitted to a billing authority (e.g., an insurance provider). In some instances, the billing process can determine that a billing report is incomplete because one or more requirements of a billing code are not satisfied (e.g., a threshold number of in-office visits during monitoring period, a threshold number of transmissions during the monitoring period, etc.). In response, the device management platform **102** can determine another billing code that does have its requirements satisfied by the current status, and generate a second billing report corresponding to the other, satisfied billing code. Additionally, the device management platform **102** can send action instructions **212** to the patient system **114** requesting an action (e.g., a data transmission) to satisfy the unsatisfied billing requirement. In some examples, the device management platform **102** can determine that the one or more outcome goal values **214** have been reached by the measured physiological parameter(s) **120** falling within a predetermined range, and can send an indication to the clinic system **106** and/or the patient system **114** indicating that the outcome goal value **214** was reached and/or that the care plan is complete.

Upon onboarding the patient and the generating the workflow **112** for the patient to include billing pathway(s) **226**, the care pathway(s) **210**, and the various care plans, a significant amount of patient details are generated and determined. The patient details can be aggregated and/or stored with an association to a patient identifier of the patient (e.g., as a patient profile). The patient details can include the initial patient data **110** as well as a variety of data generated by the device management platform **102** related to the patient. For instance, the patient details can include general patient information (e.g., name, status with respect to the health risks **208**, a medical record number (MRN), a unique management platform identifier, contact information, and/or messaging settings), technology tier information (e.g., device models and types, device capabilities, device sensors, device versions, software applications, software application versions, level of experience with technology, etc.), care team names and roles associated with the patient (e.g., a clinic personnel such as a physician, a nurse, a receptionist, etc.), and or health-related records (e.g., a list of medications, an insurance provider name, etc.). The patient details can also include data generated throughout the workflow **112**, such as during the one or more onboarding procedure(s) **108** and/or the tracking and monitoring process **312**. For

instance, the patient details can include the primary health risk **208**, the secondary health risk **208**, and/or any co-morbidities associated with the patient. Moreover, the patient details can include goal progress data, such as a status of the measured physiological parameter(s) **120** and how the measured physiological parameter(s) **120** compare to the one or more outcome goal values **214** and/or the one or more benchmark values **220**. The patient details can also keep a record of the action instructions **212** sent to the patient system **114** as well as actions taken in response to the action instructions **212**.

Furthermore, the patient details can include the various data inputs to the device management platform **102** related to the patient, such as the measured physiological parameter(s) **120** and the various threshold values (e.g., the one or more outcome goal values **214** and the one or more benchmark values **220**). Moreover, the patient details can include a histography or timeline based on (e.g., and/or indicating) the one or more outcome goal values **214**, the outcome goal date **218**, the one or more benchmark values **220**, the benchmark dates **222**, a medication prescription or change, the date of medication consumption, a data transmission record, and/or an indication of a change to the technology tier (e.g., a device change or a device addition). Moreover, the patient details can include a record of communication history for the patient, such as audio logs, communications to the patient system **114** from the clinic system **106** (e.g., the action instructions **212**), communications to the clinic system **106** from the patient system **114**, voicemails, internal clinic communications, and/or external clinic communications to other systems (e.g., cardiac device manufacturer systems, device ordering systems, etc.) and the like.

In some examples, the clinic system **106** can perform a report generating process to create one or more reports to be sent and/or presented at the clinic UI **124** or the patient UI **216**. The report generating process can generate a report in response to many of the operations discussed herein, such as a monitoring period ending, the benchmark date **222** occurring, the outcome goal date **218** occurring, the measured physiological parameter(s) **120** satisfying the one or more outcome goal values **214** or the one or more benchmark values **220**, and/or receiving an input at the clinic UI **124** requesting to generate the report. The report(s) can include any combination of the patient details discussed above, such as the histography and timeline, or other analysis results generated by the device management platform **102**. The report(s) can include a primary report corresponding to the health risks **208** and/or selected care plans for the health risks **208**, and one or more secondary reports, for instance, corresponding to a secondary health risk **208**. Additionally, the reports can indicate a mental health, a nutrition, a breakfast, a mood, or other external factor affecting patient health. Accordingly, the report(s) can encapsulate any or all data generated during a monitoring period (e.g., for a 30-day reporting window). Furthermore, the report(s) can include additional information or side notes (e.g., generated by a physician or other clinic personnel at the clinic system **106**) as well as a link to one or more past reports.

Turning to FIGS. **8-11**, various examples of the clinic system **106** and the patient UI **216** are depicted. The examples of the clinic system **106** and the patient UI **216** depicted in FIGS. **8-11** can form at least a portion of the system **100**.

For instance, FIG. **8** depicts a parameter monitoring interface section **800** which can form at least a part of the clinic UI **124**. The parameter monitoring interface section **800** can include one or more physical parameter sections **802** presenting the data collected and generated by the device management platform **102**, for instance, during the tracking and monitoring process **312**. The physical parameter section(s) **802** can correspond to the different physiological parameters being measured (e.g., heart rate, oxygen level, steps, sleep, blood pressure, weight, etc.) and can include a current or latest value **804** as well as a parameter graph **806** showing a plurality of measured physiological parameter(s) **120** graphed over time. The parameter graph **806** can also present the benchmark values **220**, for instance, as one or more horizontal lines presented on the parameter graph **806**. In addition to the visual representation of the parameter graph **806** showing how the measured physiological parameter(s) **120** compares to the one or more benchmark values **220**, a parameter status indicator **808** can also provide a clear visual indicator of whether the measured physiological parameter(s) **120** is above or below the one or more benchmark values **220** and/or the one or more outcome goal values **214**, for instance with a color coding indication (e.g., with green representing being within the benchmark range and red representing being outside the benchmark range). The monitoring interface section **800** can also present interactive interface components to receive a clinician input, such as a dismiss button for indicating acknowledgment that the measured physiological parameter(s) **120** is outside the benchmark range (e.g., above or below the one or more benchmark values **220**). Additionally, the monitoring interface section **800** (and/or other portions of the clinic UI **124** can include interactive interface components to receive an acknowledgment input indicating that the clinic personnel has performed a clinic task, such as reviewing the transmission data **118** presented at the clinic UI for a particular amount of time, which can be predetermined based on one or more billing code requirements (e.g., reviewing the information for 20 minutes, reviewing the information for an additional 20 minutes, and the like). In some examples, the monitoring interface section **800** can receive an input to toggle between presenting different measured physiological parameter(s) **120**.

In some examples, the monitoring interface section **800** can include an ECG section **810**, which can provide information about a latest ECG transmission, including a received and/or measured time stamp, a pulse reading, a heart rhythm classification (e.g., sinus rhythm) and/or an indication of one or more symptoms.

FIG. **9** depicts a goal tracker bar **900** which can form at least a part of the clinic UI **124**. The goal tracker bar **900** can be an elongated rectangle or banner-style portion of the clinic UI **124** and can present information related to how the measured physiological parameter(s) **120** compare to the one or more benchmark values **220** and the one or more outcome goal values **214**. For instance, the goal tracker bar **900** can include an interval identifier **902** to indicate the monitoring period for the goal tracker bar **900** information (e.g., by month and year). The goal tracker bar **900** can also include a days remaining indicator **904** as a number showing how many days remaining for the monitoring period. A data tracker **906** can visually indicate a percentage of transmission data **118** that has been received out of a total amount of transmission data required for the monitoring period. Furthermore, the goal tracker bar **900** can include one or more physiological parameter data icons **908**. The one or more physiological parameter data icons **908** can correspond to different physiological parameters being measured and can indicate whether or not the measured physiological parameter(s) **120** are within or outside the benchmark range (e.g., above or below the one or more benchmark values **220**) with

a simple visual indication. The physiological parameter data icons **908** can be colored red to indicate the measured physiological parameter(s) **120** being outside the benchmark range, and can be colored green or gray to indicate the measured physiological parameter(s) **120** being within the benchmark range. The goal tracker bar **900** can also include a last transmission timer **910** to present an amount of time that has elapsed since the last transmission data **118** was received. The visual indicators of the goal tracker bar **900** result in an improved clinic UI **124** by distilling the various data types being monitored and generated by the device management platform **102** into intuitive visualizations, which can be understood quickly by clinic personnel (e.g., even with minimal training), improving efficiency of the workflow **112**.

FIG. **10** depicts a physiological parameter status interface **1000** which can form at least a part of the patient UI **216**. The physiological parameter status interface **1000** can be presented at the secondary device **116** such as a mobile phone executing an application of the device management platform **102**. The physiological parameter status interface **1000** can include one or more physiological parameter tiles **1002** corresponding to the measured physiological parameter(s) **120**. The different physiological parameter tiles **1002** can present a current or latest value corresponding to the different measured physiological parameter(s) **120**. Moreover, the one or more physiological parameter tiles **1002** can include latest update time stamp indicators. In some instances, the physiological parameter status interface **1000** includes a data update button **1004** which, upon receiving a user input, causes the patient system **114** (e.g., the secondary device **116**) to send an updated transmission data **118** to the clinic system **106**. The data update button **1004** can have a size (e.g., a diameter dimension in scenarios where the data update button **1004** is a circle) that is larger than other icons of the patient UI **216** (e.g., a home icon, a history icon, etc.) to give the data update button **1004** a prominent visual presentation. In some instances, the user input is received at the data update button **1004** in response to receiving the action instructions **212** at the patient system **114**.

FIG. **11** depicts a workflow interface **1100** to present features of the workflow **112**, which can form at least a part of the clinic UI **124**. The workflow interface **1100** can also include the monitoring interface section **800** and the goal tracker bar **900** discussed above.

For instance, the workflow interface **1100** can present the monitoring interface section **800** concurrently (e.g., simultaneously) with presenting a patient detail section **1102**, for instance, as a side bar. The patient detail section **1102** can include a patient ID number, a patient age, a patient date of birth, a patient sex, a patient phone number, one or more device international mobile equipment identity (IMEI) identifiers (e.g., for the Bluetooth® scale, the Bluetooth® blood pressure device, etc.), a patient email address, a physician name assigned to the patient, and/or patient notes. The workflow interface **1100** can also include a resend invite button **1104** (e.g., at the patient detail section **1102** which, in response to an input, causes a message to be sent to the patient system **114** to initiate or re-initiate the onboarding procedure(s) **108**). The patient detail section **1102** can also include an edit button to provide modifications to the patient details presented in the patient detail section **1102**. In some examples, the patient details can include various timelines showing interventions (e.g., action instructions **212**), so that the impact of such interventions on the measured physiological parameter(s) **120** is visually presented.

In some instances, the workflow interface **1100** includes a monitoring period label section **1106** to indicate if the monitoring period being presented at the workflow interface **1100** is the current monitoring period and/or a month and year of the monitoring period. The workflow interface **1100** can also include an approve button **1108** to receive an input indicating that clinic personnel has reviewed the information presented at the workflow interface **1100** and approves the monitoring period for billing (e.g., to initiate operations of the billing pathway **226**). Moreover, the workflow interface **1100** can include an internal patient notes section **1110** to receive inputs generating clinic notes for the patient and/or the monitoring period which are only accessible by the clinic system **106**.

In some examples, the analytics and reporting process **302** can be performed by the device management platform **102**, the results of which can be presented at the clinic UI **124** (e.g., the workflow interface **1100**). For instance, the device management platform **102** can analyze historical data to determine that a group of patients have a common or same outcome goal value **214**, device types or device parameters for individual patients of the groups of patient (e.g., the technology tiers of the patients in the group of patients), and which device types or device parameters correlate to a higher likelihood of reaching the outcome goal value **214**. Furthermore, the device management platform **102** can detect clinic actions occurring at the clinic system **106** and/or the clinic UI **124** and clinic action characteristics. For instance, the device management platform **102** can determine a duration of time that a portion of the clinic UI **124** (e.g., the workflow interface **1100**) is viewed, a sequence in which features of the clinic UI **124** are interacted with, and the like.

Furthermore, the device management platform **102** can compare outcome results and device capabilities/secondary device **116** (e.g., technology tiers) of patients having a particular care plan or care pathway **210** (e.g., the heart failure pathway **518**), thus determining correlations between types of devices and success rates (e.g., and/or medication consumption rates). For instance, the device management platform **102** may determine that patients using a smart watch have a higher likelihood of reaching the outcome goal values **214** and/or a higher likelihood of consistent medication consumption.

In some examples, the device management platform **102** can include an intervention tracker which can track and/or analyze interventions (e.g., action instructions **212**) throughout the duration of the care plan. The intervention tracker can interface with an Electronic Healthcare Record (EHR) to receive, from the EHR, indications of any medication changes of the patient (e.g., automatically). The intervention tracker can adjust the one or more benchmark values **220** to reflect an expected change in a physiological parameter corresponding to the medication. The intervention tracker can track phone calls with the patient as well. Moreover, the device management platform **102** can track whether the patient is active or not and if the patient experiences any lifestyle activity changes, stress factor changes, or hospitalizations.

FIG. **12** illustrates an example system **1200** to provide the device management platform **102** which can include one or more computer system(s) **1202** which implement the systems **100-800** and the interfaces **900-1100** discussed herein. In one implementation, the one or more computing device(s) **1202** include the devices of the clinic system **106**, the patient

system **114** (e.g., the patient device **104**, the secondary device **116**, etc.), the one or more servers **204**, and/or the database(s) **202**.

In some instances, the computing device(s) **1202** includes a computer, a personal computer, a desktop computer, a laptop computer, a terminal, a workstation, a cellular or mobile phone, a mobile device, a smart mobile device a tablet, a wearable device (e.g., a smart watch, smart glasses, a smart epidermal device, etc.) a multimedia console, a television, an Internet-of-Things (IoT) device, a smart home device, a medical device, a virtual reality (VR) or augmented reality (AR) device, and/or the like. The computing device(s) **1202** may be integrated with, form a part of, or otherwise be associated with the systems **100-800** and interfaces **900-1100**. It will be appreciated that specific implementations of these devices may be of differing possible specific computing architectures not all of which are specifically discussed herein but will be understood by those of ordinary skill in the art.

The computing device **1202** may be a computing system capable of executing a computer program product to execute a computer process. The device management platform **102** can be stored and executed at the computing device **1202** (e.g., as one or more software components). Data and program files may be input to the computing device **1202** (e.g., the transmission data **118** including the measured physiological parameter(s) **120**, clinician inputs setting the one or more outcome goal values **214**, the outcome goal date **218**, the one or more benchmark values **220**, the benchmark dates **222**, and the like), which can read the files and executes the programs therein to generate the workflow **112** (e.g., the care pathways **210**, the billing pathway **226**, the care plans, etc.). Some of the elements of the computing device **1202** include one or more hardware processors **1204**, one or more memory devices **1206**, and/or one or more ports, such as input/output (IO) port(s) **1208** and communication port(s) **1210**. Additionally, other elements that will be recognized by those skilled in the art may be included in the computing device **1202** but are not explicitly depicted in FIG. **12** or discussed further herein. Various elements of the computing device **1202** may communicate with one another by way of the communication port(s) **1210** and/or one or more communication buses, point-to-point communication paths, or other communication means.

The processor **1204** may include, for example, a central processing unit (CPU), a microprocessor, a microcontroller, a digital signal processor (DSP), and/or one or more internal levels of cache. There may be one or more processors **1204**, such that the processor **1204** comprises a single central-processing unit, or a plurality of processing units capable of executing instructions and performing operations in parallel with each other, commonly referred to as a parallel processing environment.

The computing device **1202** may be stand-alone computer, a distributed computer, or any other type of computer, such as one or more external computers made available via a cloud computing architecture. The presently described technology is optionally implemented in software stored on the data storage device(s) such as the memory device(s) **1206**, and/or communicated via one or more of the ports **1208** and **110**, thereby transforming the computing device **1202** in FIG. **12** to a special purpose machine for implementing the operations described herein. Moreover, the unconventional arrangement of the one or more computing devices **1202** into the clinic system **106** and the patient system **114** (e.g., including the patient device **104** and the secondary device **116**), as discussed herein, improves the fields of technology of implantable cardiac devices and implantable cardiac device monitoring software.

The one or more memory device(s) **1206** may include any non-volatile data storage device capable of storing data generated or employed within the computing device **1202**, such as computer-executable instructions for performing a computer process, which may include instructions of both application programs and an operating system (OS) that manages the various components of the computing device **1202**. The memory device(s) **1206** may include, without limitation, magnetic disk drives, optical disk drives, solid state drives (SSDs), flash drives, and the like. The memory device(s) **1206** may include removable data storage media, non-removable data storage media, and/or external storage devices made available via a wired or wireless network architecture with such computer program products, including one or more database management products, web server products, application server products, and/or other additional software components. Examples of removable data storage media include Compact Disc Read-Only Memory (CD-ROM), Digital Versatile Disc Read-Only Memory (DVD-ROM), magneto-optical disks, flash drives, and the like. Examples of non-removable data storage media include internal magnetic hard disks, SSDs, and the like. The one or more memory device(s) **1206** may include volatile memory (e.g., dynamic random-access memory (DRAM), static random-access memory (SRAM), etc.) and/or non-volatile memory (e.g., read-only memory (ROM), flash memory, etc.).

Computer program products containing mechanisms to effectuate the systems and methods in accordance with the presently described technology may reside in the memory device(s) **1206** which may be referred to as machine-readable media. It will be appreciated that machine-readable media may include any tangible non-transitory medium that is capable of storing or encoding instructions to perform any one or more of the operations of the present disclosure for execution by a machine or that is capable of storing or encoding data structures and/or modules utilized by or associated with such instructions. Machine-readable media may include a single medium or multiple media (e.g., a centralized or distributed database, and/or associated caches and servers) that store the one or more executable instructions or data structures.

In some implementations, the computing device **1202** includes one or more ports, such as the I/O port **1208** and the communication port **1210**, for communicating with other computing, network, or vehicle devices. It will be appreciated that the I/O port **1208** and the communication port **1210** may be combined or separate and that more or fewer ports may be included in the computing device **1202**.

The I/O port **1208** may be connected to an I/O device, or other device, by which information is input to or output from the computing device **1202**. Such I/O devices may include, without limitation, one or more input devices, output devices, and/or environment transducer devices.

In one implementation, the input devices convert a human-generated signal, such as, human voice, physical movement, physical touch or pressure, and/or the like, into electrical signals as input data into the computing device **1202** via the I/O port **1208**. Similarly, the output devices may convert electrical signals received from the computing device **1202** via the I/O port **1208** into signals that may be sensed as output by a human, such as sound, light, and/or touch. The input device may be an alphanumeric input device, including alphanumeric and other keys for communicating information and/or command selections to the pro-

cessor **1204** via the I/O port **1208**. The input device may be another type of user input device including, but not limited to: direction and selection control devices, such as a mouse, a trackball, cursor direction keys, a joystick, and/or a wheel; one or more sensors, such as a camera, a microphone, a positional sensor, an orientation sensor, an inertial sensor, and/or an accelerometer; and/or a touch-sensitive display screen ("touchscreen"). The output devices may include, without limitation, a display, a touchscreen, a speaker, a tactile and/or haptic output device, and/or the like. In some implementations, the input device and the output device may be the same device, for example, in the case of a touchscreen.

In one implementation, the communication port **1210** is connected to the network **206** and the computing device **1202** may receive network data useful in executing the methods and systems set out herein as well as transmitting information and network configuration changes determined thereby. Stated differently, the communication port **1210** connects the computing device **1202** to one or more communication interface devices configured to transmit and/or receive information between the computing device(s) **1202** and other computing device(s) **1202** by way of one or more wired or wireless communication networks or connections. Examples of such networks or connections include, without limitation, Universal Serial Bus (USB), Ethernet, Wi-Fi, Bluetooth®, Near Field Communication (NFC), and so on. One or more such communication interface devices may be utilized via the communication port **1210** to communicate one or more other machines, either directly over a point-to-point communication path, over a wide area network (WAN) (e.g., the Internet), over a local area network (LAN), over a cellular network (e.g., third generation (3G), fourth generation (4G), Long-Term Evolution (LTE), fifth generation (5G), etc.) or over another communication means. Further, the communication port **1210** may communicate with an antenna or other link for electromagnetic signal transmission and/or reception.

In an example implementation, device management platform **102** may be embodied by instructions stored on the memory devices **1206** and executed by the processor **1204**.

The system **1200** set forth in FIG. **12** includes but one possible example of a computing device **1202** that may employ or be configured in accordance with aspects of the present disclosure. It will be appreciated that other non-transitory tangible computer-readable storage media storing computer-executable instructions for implementing the presently disclosed technology on a computing system may be utilized. In the present disclosure, the methods disclosed may be implemented as sets of instructions or software readable by the computing device **1202**.

FIG. **13** illustrates an example method **1300** to manage one or more patient devices **104** using the device management platform **102**, which can be performed by any of the systems **100-800** or **1200** or presented at any of the interfaces **900-1100**.

In some examples, at operation **1302**, the method **1300** onboards a plurality of patients corresponding to a plurality of patient devices to a device management platform. At operation **1304**, the method **1300** associates a care pathway with a patient of the plurality of patients having a patient device of the plurality of patient devices, the care pathway defining a particular health risk and an outcome goal value for a physiological parameter associated with the particular health risk. At operation **1306**, the method **1300** receives transmission data originating from the patient device. At operation **1308**, the method **1300** determines, from the transmission data, a measured value corresponding to the physiological parameter. At operation **1310**, the method **1300** determines whether the measured values is above or below a benchmark value. At operation **1312**, the method **1300** causes an action instruction to be presented at a user device associated with the patient in response to whether the measured value is above or below the benchmark value.

It is to be understood that the specific order or hierarchy of steps in the method **1300** depicted in FIG. **13**, and throughout this disclosure, are instances of example approaches and can be rearranged while remaining within the disclosed subject matter. For instance, any of the operations depicted in FIG. **13** or throughout this disclosure may be omitted, repeated, performed in parallel, performed in a different order, and/or combined with any other of the operations depicted in FIG. **13** or throughout this disclosure.

While the present disclosure has been described with reference to various implementations, it will be understood that these implementations are illustrative and that the scope of the present disclosure is not limited to them. Many variations, modifications, additions, and improvements are possible. More generally, implementations in accordance with the present disclosure have been described in the context of particular implementations. Functionality may be separated or combined differently in various implementations of the disclosure or described with different terminology. These and other variations, modifications, additions, and improvements may fall within the scope of the disclosure as defined in the claims that follow.

What is claimed is:

1. A method to manage patient devices, the method comprising:

associating, using one or more processors of a computing device, a care pathway with a patient having a patient device, the care pathway defining:

a particular health risk and an outcome goal value for a physiological parameter associated with the particular health risk;

an outcome goal date associated with the outcome goal value; and

one or more benchmark dates corresponding to one or more one or more benchmark values of the physiological parameter, the one or more benchmark dates and one or more benchmark values being based at least partly on the outcome goal value and the outcome goal date;

receiving, using a wireless transmission interface, transmission data originating from the patient device;

determining, from the transmission data, a measured value corresponding to the physiological parameter;

determining whether the measured value is above or below a benchmark value of the one or more benchmark values;

generating an intervention in response to whether the measured value is above or below the benchmark value; and

causing the intervention to be presented at a user device associated with the patient.

2. The method of claim **1**, wherein the user device is a mobile device that captures the transmission data from the patient device and transmits the transmission data to a device management platform device remote from the mobile device.

3. The method of claim **1**, wherein the care pathway is defined by one or more billing codes as one or more of:

a remote patient monitoring pathway;

a chronic care management pathway;

a primary care management pathway;
a transitional care management pathway;
a remote therapy monitoring pathway; or
a heart failure pathway.

4. The method of claim **1**, wherein the physiological parameter is one or more of:
an amount of a physical activity;
a heart rate;
an amount of a sleep activity;
a blood oxygen saturation; or
an electrocardiogram (ECG) measurement.

5. The method of claim **1**, wherein the transmission data is first transmission data from a first device being the user device, and further comprising receiving second transmission data from a second device, the second transmission data including:
a measured weight value;
a measured blood pressure value;
a measured glucose value; or
a measured temperature value.

6. The method of claim **5**, wherein the second device is:
a Bluetooth device to send the second transmission data to the user device for transmission to a device management platform device; or
a cellular device to send the second transmission data to the device management platform device.

7. The method of claim **1**, further comprising:
determining that a monitoring period, associated with one or more of a first benchmark date of the one or more benchmark dates or the outcome goal date, has completed;
receiving a clinician input, at a clinic user interface (UI), corresponding to the monitoring period that has completed; and
generating, in response to the clinician input, a report for the monitoring period.

8. The method of claim **7**, wherein the monitoring period is based on one or more of a Current Procedural Terminology (CPT) billing code.

9. The method of claim **7**, wherein the clinician input is a first clinician input and further comprising:
receiving, at the clinic UI, a second clinician input indicating whether the monitoring period is a 30-day monitoring period or a calendar month monitoring period.

10. The method of claim **1**, further comprising determining a medication consumption date associated with the patient, wherein:
the transmission data is received after the medication consumption date; and
the benchmark value is at least partly based on the medication consumption date.

11. A method to manage a patient device, the method comprising:
associating, using one or more processors of a computing device, a care pathway with a patient having the patient device based on a clinician input received at a clinic user interface (UI), the care pathway defining:
a particular health risk associated with one or more physiological parameters; and
one or more predetermined threshold values corresponding to the one or more physiological parameters;
receiving, using a wireless transmission interface, transmission data originating from the patient device;
determining, from the transmission data, a measured value corresponding to a physiological parameter of the one or more physiological parameters;
determining whether the measured value is above or below a predetermined threshold value of the one or more predetermined threshold values;
presenting an indication of whether the measured value is above the predetermined threshold value at the clinic UI;
generating an intervention in response to whether the measured value is above or below the predetermined threshold value; and
causing the intervention to be presented at a patient UI displayed at a user device associated with the patient.

12. The method of claim **11**, wherein the intervention indicates an amount of steps to be walked for a number of one or more days.

13. The method of claim **11**, wherein the clinician input is a first clinician input, and further comprising:
receiving a second clinician input at the clinic UI indicating the predetermined threshold value;
storing the predetermined threshold value at a device management platform storage device in response to the second clinician input; and
retrieving the predetermined threshold value from the device management platform storage device to determine whether the measured value is above or below the predetermined threshold value.

14. The method of claim **13**, further comprising receiving a third clinician input at the clinic UI in response to presenting the indication of whether the measured value is above the predetermined threshold value, causing the intervention to be presented at the patient UI is in response to the third clinician input.

15. The method of claim **13**, further comprising receiving an updated data transmission in response to causing the intervention to be presented at the patient UI.

16. A method to manage a patient device, the method comprising:
associating, using one or more processors of a computing device, a plurality of care pathways with a plurality of patients having a plurality of patient devices, a care pathway of the plurality of care pathways defining:
a particular health risk for a patient of the plurality of patients, the particular health risk being associated with one or more physiological parameters; and
one or more predetermined threshold values corresponding to the one or more physiological parameters;
receiving, using a wireless transmission interface, transmission data originating from the plurality of patient devices;
receiving, at a clinic user interface (UI), a first clinician input selecting a patient identifier corresponding to the patient;
determining, from the transmission data and in response to the first clinician input, a measured value corresponding to a physiological parameter of the one or more physiological parameters for the patient;
presenting, at the clinic UI, an indication of whether the measured value is above or below a predetermined threshold value of the one or more predetermined threshold values;
generating an intervention in response to a second clinician input at the clinic UI; and
causing the intervention to be presented at a patient UI displayed at a user device associated with the patient.

17. The method of claim **16**, wherein the intervention is a first intervention, and further comprising:
determining user device parameters of the user device associated with the patient;

determining that the user device parameters fail to satisfy a device requirement associated with the care pathway; and

causing, in response to the user device parameters failing to satisfy the device requirement, one or more of:

a second intervention to be presented at the patient UI displayed at the user device; or

a supplemental device to be shipped to a physical address associated with the patient identifier.

18. The method of claim **16**, further comprising:

receiving, a third clinician input at the clinic UI; and

presenting, in response to the third clinician input, a patient profile including two or more of:

a device type or parameter of the user device;

the care pathway associated with the patient;

a device requirement associated with the physiological parameter defined by the care pathway;

a latest measured value associated with an outcome goal; or

an indication of whether the measured value is greater than a benchmark value.

19. The method of claim **16**, further comprising:

determining a Current Procedural Terminology (CPT) billing code associated with the care pathway;

determining a monitoring period associated with the CPT billing code, the one or more predetermined threshold values including a benchmark value for the monitoring period;

determining a data transmission schedule corresponding to the monitoring period; and causing the user device to transmit the transmission data according to the data transmission schedule.

20. The method of claim **19**, wherein the CPT billing code is a first CPT billing code, and further comprising:

determining that clinician activity or a data transmission fails to satisfy a first requirement of the first CPT billing code for the monitoring period; and

in response to the clinician activity or the data transmission failing to satisfy the first requirement of the first CPT billing code, determining that the clinician activity or the data transmission satisfies a second requirement of a second CPT billing code for the monitoring period; and

generating a report corresponding to the second CPT billing code instead of the first CPT code for the monitoring period.

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